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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 12, NUMBER 4
FEBRUARY 15, 1979

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 12, NUMBER 4
FEBRUARY 15, 1979

W79-01501 -- W79-02000

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

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07 RESOURCES DATA
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

SOLAR PHOTOLYSIS OF WATER,
For primary bibliographic entry see Field 2K.
W79-01883

2. WATER CYCLE

2A. General

UNITED STATES PARTICIPATION IN THE INTERNATIONAL HYDROLOGICAL PROGRAM 1975-.
National Committee for the International Hydrological Decade, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 153, Price codes: A02 in paper copy, A01 in microfiche. A Report of the Panel on Post-Decade Procedures to the United States National Committee for the International Hydrological Decade, National Academy of Sciences, Washington, D.C., 1974. 23 p, 1 fig. NSF C-310.

Descriptors: *International Hydrological Decade, *United States, *Programs, *Planning, Coordination, Administration, Research and development, Information exchange, Water resources, Hydrology, Institutions, Administrative agencies, *International Hydrological Program.

The Panel concluded that the International Hydrological Program (IHP) of UNESCO merits the support of the United States and suggested a mechanism which it believes will be useful in implementing that program. The Panel believes that its recommendations meet the objectives of its terms of reference, which call for a mechanism able to evaluate the scientific merit of international water-related projects and the establishment of a lead-agency relationship between the IHP of UNESCO, the Department of State, and an appropriate federal agency. As the International Hydrological Decade experience demonstrated, any mechanism will work only as well as its activities are supported by related operations in the Department of State. To this end, the Panel supplements its basic terms of reference by recommending (1) improvement in the coordination of water-related programs under the Department of State's supervision and (2) augmentation of the science (particularly water-related science) capabilities of its staff assigned to relevant UN agencies. The implementation of these recommendations, the Panel believes, will constitute a major step forward in support of U.S. policy, and will be of consequent benefit to the United States and the advancement of science. (Humphreys-ISWS)
W79-01509

THREE-DIMENSIONAL FLOW SIMULATION IN ESTUARIES,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W79-01524

RALSTON CREEK HOURLY PRECIPITATION MODEL,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2B.
W79-01727

HYDROLOGIC INTERPRETATION OF BASIN MORPHOLOGY,
Alaska Univ., Fairbanks. Inst. of Water Resources.
J. D. Fox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 368, Price codes: A02 in paper copy, A01 in microfiche. Report IWR-95, August 1978. 14 p, 36 ref. OWRT A-049-ALAS(1), 14-31-0001-5002.

Descriptors: *Alaska, *Hydrologic models, *Geomorphology, *Subarctic, *Arctic, Basins, Model studies, *Basin morphology, Small watersheds, *Slopes, *Channel network analysis, Streamflow.

Methods of quantitative geomorphology were reviewed with emphasis on hillslope profile and channel network analyses. Parameters useful in relating basin form to hydrologic processes were identified and incorporated into an hydrologic model of small, upland watersheds. Sensitivity of streamflow to these parameters was investigated and recommendations for coupling form and function in watershed model design were made.
W79-01899

THE CONTRIBUTION OF MERCURY AND CHLORINATED ORGANICS FROM URBAN RUNOFF,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
For primary bibliographic entry see Field 5B.
W79-01918

IMPACT OF URBANIZATION ON THE HYDROLOGY OF WAIRAU CREEK, NORTH SHORE, AUCKLAND,
Auckland Univ. (New Zealand). Dept. of Geography.
For primary bibliographic entry see Field 2E.
W79-01922

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
D. E. Fields, and R. J. Raridon.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 140-150, 1977. 14 fig, 17 ref. RANN NSF AG-389.

Descriptors: *Hydrologic cycle, *Model studies, *Water pollution, *Watersheds(Basins), *Tennessee, Water pollution sources, Routing, Hydrologic systems, Hydrographs, Computer models, Hydrologic aspects, Water quality, Erosion, Sediment transport, Fallout, Surface runoff, Analysis, Analytical techniques, Air pollution, Unified transport model.

A Unified Transport Model (UTM) which simulates hydrologic and trace element transport through the atmospheric, land, and channel ecosystems on a watershed scale was implemented and applied to Walker Branch Watershed, Oak Ridge, Tennessee. Contaminant inputs to the land surface are wetfall and dryfall as simulated by the atmospheric transport submodel, which is based on a Gaussian plume formulation. The UTM, portions of which are derived from the Stanford Watershed Model, is a mechanistic approach and incorporates algorithms detailing chemical exchange between the sediment and water phases at the land surface and in the channel system itself. Sediment transport in the channel is simulated via the CHNSED submodel where sediment dynamics are governed by bedload and suspended load transport, with each of these components partitioned into as many as twelve size classes. (See also W79-01932) (Humphreys-ISWS)
W79-01946

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART II. VALIDATION STUDIES,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
R. J. Raridon, and D. E. Fields.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 151-161, 1977, 4 fig, 3 tab, 7 ref, 1 append. RANN NSF AG-389.

Descriptors: *Hydrologic cycle, *Model studies, *Watersheds(Basins), *Tennessee, *Hydrograph analysis, Discharge(Water), Simulation analysis, Hydrologic aspects, Water quality, Surface runoff, Analysis, Analytical techniques, Computer models, Hydrographs, Potassium, Cadmium, Calibrations, *Walker Branch Watershed(Tenn), Unified transport model, Model validation.

A portion of the Unified Transport Model was validated through simulation of water, potassium, and cadmium transport on Walker Branch Watershed, Oak Ridge, Tennessee. The catchment terrain of the heavily forested 98 hectare watershed is dolomitic, while the soils are predominantly of the Fullerton or Bodine series. Measurements of wetfall and dryfall, together with hourly rainfall and daily meteorological data, provided the input for the computer program. The calculated outflows from the watershed agreed closely with the measured data. There is a net loss of potassium from the watershed while cadmium appears to be building up. (See also W79-01932) (Humphreys-ISWS)
W79-01947

THE HYDROLOGY OF KARST URBAN AREAS,
Tennessee Valley Authority, Knoxville.
R. P. Betson.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 162-175. 1977. 3 fig, 5 tab, 16 ref.

Descriptors: *Karst hydrology, *Cities, *Model studies, *Small watersheds, Hydrologic aspects, Hydrograph analysis, Water quality, Hydrographs, Karst, Hydrology, Storm runoff, Land use, Suburban areas, Watersheds(Basins), Discharge(Water), Base flow, Flood frequency.

A systematic study of the hydrology of 4 small watersheds was undertaken in Knoxville, Tennessee. Three of the watersheds were over soluble carbonate rock. Models were used to simulate equivalent rural-area hydrologic response and to help in quantifying the hydrology. It was found that urbanization can increase markedly the yield of runoff, when under rural conditions much of the potential runoff is lost to a soluble rock system. When these large increases to runoff yield are realized, the magnitude of flooding is also increased much more than would occur on other areas. On the other hand, the water quality from these urban watersheds was not found to be particularly impacted as compared with rural areas. There were some problems associated with erosion that were identified. It also was found that the atmosphere can be a major source of constituents, and karst area watersheds that lose much of their potential runoff into the carbonate rock system may be serving as filters. (See also W79-01932) (Humphreys-ISWS)
W79-01948

2B. Precipitation

ANALYSIS OF SEASONAL PERSISTENCE OF CLIMATE IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Geography.
M. P. Lawson, A. V. Douglas, and P. J. Englehart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 226, Price codes: A08 in paper copy, A01 in microfiche. Occasional Papers No 4, Project Completion Report, October, 1978. 143 p, 41 fig, 6 tab, 31 ref. OWRT A-049-NEB(1). 14-34-0001-8029.

Descriptors: *Climates, *Forecasting, *Seasonal persistence, Climatology, *Model studies, Synoptic studies, *Nebraska.

The purpose was to develop statistical and synoptic probabilistic models for forecasting seasonal climate in Nebraska by evaluating the application of climatological contingencies, statistical regression analysis and the interpretation of teleconnections between tropospheric pressure patterns and associated departures from normal weather conditions. The intra-seasonal relationship between temperature and precipitation in the state tends to be inverse in all seasons (hot-dry, cold-wet). Once a seasonal anomaly develops, persistance can be expected. Anomalously warm temperatures in summer and fall generally persist into the subsequent season. Below normal temperatures during the spring and fall have a high probability of continuing into the following season. Apparently there is a weak tendency for reversal of temperatures or a return to normal temperatures in springs which have been preceded by cold winters. Anomalies of precipitation are less predictable. Examination of midtropospheric flow patterns indicates cold, wet periods are frequently associated with major trough development in the western plains. Warm, dry seasons are associated with persistent positive height anomalies in the southern and central plains. Seasonal forecasts derived from persistence models alone were within plus or minus one class value 92 percent of the time for temperature contingencies and 78 percent for precipitation predictions.
W79-01538

SOLAR RADIATION AND URBAN HEAT ISLANDS,
California Univ., Los Angeles. Dept. of Geography.
W. H. Terjung, and S. S-F. Louie.
Annals of the Association of American Geographers, Vol. 63, No. 2, June 1973, p 181-207. 23 fig, 1 tab. (Univ. of California Water Resources Center Project W-237). OWRT B-121-CAL(4).

Descriptors: *Climatology, *Solar radiation, Building climatology, Urban climatology, Urban heat islands, Cities.

A model which attempts to simulate urban absorption of solar radiation is concerned with direct solar radiation, diffuse sky radiation, diffuse radiation reflected by buildings and streets, and the shortwave energy absorbed by typical urban structures. The ratio between solar radiation absorbed by three-dimensional building-street systems and two-dimensional horizontal surfaces under cloudless conditions indicates that cities undergo great variations with latitude and season. High structure systems absorb more than six times the radiation of nonurban plains. Shading effects can create absorptance less than that of a level surface. Observations at street level may lead to erroneous conclusions concerning the energy input for the total urban interface. The examination of a circular synthetic city with varying latitudinal radiation responses indicates that daytime urban heat islands are migratory phenomena and probably influence convective air circulation in the city, that downtown areas often absorb less energy than the periphery of the inner zone, and that the mere existence of a city is sufficient to generate heat islands. (Snyder-Calif, Davis)
W79-01568

RALSTON CREEK HOURLY PRECIPITATION MODEL,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, R. N. Eli, II, and J. D. Cryer.
Water Resources Research, Vol. 14, No. 3, p 485-490, June 1978. 3 fig, 2 tab, 19 ref. OWRT A-053-IA(6) and B-055-IA(3).

Descriptors: *Precipitation(Atmospheric), *Rainfall, *Model studies, *Mathematical models, Stochastic processes, Climatic data, Storms, Rainfall intensity, Depth-area-duration analysis, Statistical models, Data processing, Watersheds(Basins), Meteorology, Climatology, *Precipitation models.

A stochastic hourly precipitation model was developed by using the Iowa City-Ralston Creek hourly precipitation record of 33 years length. Six divisions of the year were used to account for seasonal nonstationarity. Related wet time intervals, corresponding to storm events, were scheduled by an exponentially distributed interarrival time model. Intrastorm structure was described in terms of 'storm segments,' corresponding to the passage of a storm rainfall cell or a group of cells. It was found that the location in time and the duration of storm segments can be modeled adequately by independent random variables, thus avoiding traditional computation difficulties in modeling the persistence effects encountered in hourly data. Obseved 'persistence' was preserved, since persistence results from the clustering of wet hours and the clustering of dry hours. The intensity and distribution of precipitation within storm segments were modeled by fitted log normal intensity probability distributions and by cataloging sample storm segment shapes. Generated data analysis indicated that very precise precipitation modeling and extremely high speed data generation result. (Sims-ISWS)
W79-01727

2C. Snow, Ice, and Frost

VARIATIONS IN THE DURATION OF STABLE SNOW COVER IN THE USSR,
I. D. Kopanev.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 270-275, 1976. 3 fig, 1 tab, 10 ref. Translated from Transactions of the Main Geophysical Observatory (Trudy GGO), No. 349, p 14-26, 1976.

Descriptors: *Snow cover, *Spatial distribution, *Data collections, Statistical methods, Data processing, Maps, Statistics, Time, Variability, Foreign countries, Foreign research, Snow, *USSR.

Investigated were the spatial characteristics of variations in snow cover duration on the basis of long-period mean data and published sources. Information on the formation and destruction of stable snow cover was found in the voluminous tables of the Climatic Handbook of the USSR. Three maps were presented which give an indication of the distribution in days of: (1) snow cover duration; (2) the difference in the dates of appearance and formation of a stable snow cover; and (3) the difference in the dates of the destruction and disappearance of a stable snow cover. Data showed that a snow cover forms in the European USSR mainly at the end of October in the north and in mid-December in the south. The average snow cover duration decreases from north to south from 200-220 days (Khibiny, Khaseda-Khard) to 60-120 days (southern Ukraine and Northern Caucasus). Standard statistical parameters of the variability of snow cover duration were tabulated for each of 26 Hydrometeorological Service Administrations. (Humphreys-ISWS)
W79-01506

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 7B.
W79-01512

SNOWPACK GROUND TRUTH: RADAR TEST SITE, STEAMBOAT SPRINGS, COLORADO, APRIL 8-16, 1976,
Bittinger (M. W.) and Associates, Inc., Fort Collins, CO.
S. Howell, E. B. Jones, and C. F. Leaf.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-28633, Price codes: A03 in paper copy, A01 in microfiche. NASA Contract Report 144773, April 1976. 28 p, 6 fig, 20 tab, 2 ref. NASA NAS 5-22312.

Descriptors: *Snowpacks, *Snow surveys, *Colorado, *Remote sensing, Snow, Moisture content, Temperature, Soil moisture, Sampling, Surveys, On-site investigations, *Ground truth.

This report contained the ground-truth data taken at Steamboat Springs, Colorado, during the period April 8 - 16, 1976. The location of the Steamboat Springs site used in this mission was shown in a general location map and in detail. This area is located in the Yampa River Valley approximately 7 mi (11 km) south of the town of Steamboat Springs, Colorado. Data taken during this period included the following: (1) snow depths and densities at selected locations (using a Mount Rose snow tube), (2) snow pits for temperature, density, and liquid water determinations using the freezing calorimetry technique and vertical layer classification, (3) snow walls were constructed of various cross sections and were documented with respect to sizes and snow characteristics, (4) soil moisture at selected locations, and (5) appropriate air temperature and weather data. (Sims-ISWS)
W79-01527

AN ANALYSIS OF SENSIBLE AND LATENT HEAT FLOW IN A PARTIALLY FROZEN UNSATURATED SOIL,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
For primary bibliographic entry see Field 2G.
W79-01711

2D. Evaporation and Transpiration

APPLICATION OF REMOTE SENSING IN ESTIMATING EVAPOTRANSPIRATION IN THE PLATTE RIVER BASIN,
Nebraska Univ., Lincoln.
For primary bibliographic entry see Field 7B.
W79-01521

REDUCING PHREATOPHYTE TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3B.
W79-01562

A NONDESTRUCTIVE APPROACH TO REDUCING RIPARIAN TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 3B.
W79-01586

LINEARIZED MOISTURE FLOW WITH LOSS AT THE SOIL SURFACE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 2G.
W79-01704

ANALYSIS OF FALLOW-FARMING SYSTEMS IN SEMI-ARID AFRICA USING A MODEL TO SIMULATE THE HYDROLOGIC BUDGET,
California Univ., Riverside. Dept. of Plant Sciences.
A. E. Hall, and C. Dancette.
Agronomy Journal, Vol. 70, No. 5, p 816-823, September-October, 1978. 10 fig, 4 tab, 16 ref.

Descriptors: Semiarid climates, Fallowing, Model studies, Simulation analysis, Hydrologic budget, Evaporation, Water conservation, *Soil moisture, Root system, Absorption, *Africa, *Soil evaporation.

A model was developed to predict bare soil evaporation, crop water use, and the distribution of water in the soil. Comparisons with hydrologic budget data obtained in the field with bare soil, cowpeas (Vigna unguiculata (L.) Walp.), and millet (Pennisetum typhoides (Burm. f.)S. and W.) indicated that the models performed adequately for the conditions and objectives of the study. Simulations of annual fallow, predicted that the amounts of water conserved in the soil would rapidly decrease with decreases in annual rainfall. The simulations predicted that substantial quantities of water may be conserved in the soil by partial fallow during wetter years. More soil moisture

would be conserved in the soil by partial fallow during wetter years. More soil moisture would be conserved with the shorter cycle variety, but the longer cycle variety would have greater need for this moisture in this climatic zone during dry years, indicating a possible advantage of rotations involving short cycle, and long cycle crops. The simulations predicted that present varieties may only use a small proportion of the moisture that may be stored below 150 cm depth in the soil by partial fallow, indicating a possible need for developing varieties with faster growing, deeper, root systems. (Skogerboe-Colorado State)
W79-01785

COMPUTING EVAPORATION FOR INLAND WATER BODIES UNDER A VARIETY OF FETCH AND ATMOSPHERIC STABILITY CONDITIONS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
S. L. Taylor, and D. R. DeWalle.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 372, Price codes: A05 in paper copy, A01 in microfiche. Research Project Technical Completion Report. November 1978. 72 p, 4 fig, 9 tab, 17 ref, 5 append. OWRT B-094-PA(1), 14-34-0001-7128.

Descriptors: *Evaporation lakes, Oklahoma, Texas, Australia, Pennsylvania, Susquehanna River(Penn), *Equations(Evaporation), *Cooling water, *Thermal pollution, Ponds, *Thermal loading, *Atmospheric stability, *Fetch length, *Free convection, *Forced convection, Cooling pond.

An equation is developed to predict evaporation from inland water bodies which accounts for the effects of atmospheric stability and fetch length. The equation contains a term representing free convection, forced convection and the interaction of forced and free convection. The equation contains a term representing free convection, forced convection and the interaction of forced and free convection. The equation was tested against the Ryan and Harleman evaporation equation which does not include an explicit fetch term but which does account for free convection. Data sets from lake and cooling pond evaporation studies, e.g. Lake Hefner (Oklahoma), Smithers Lake (Texas), and Hazelwood (Australia) cooling ponds, were used to derive empirical coefficients and initially test the equation. The equations were also compared using data from a thermally-loaded reach of the West Branch Susquehanna River in Pennsylvania. Although evaporation predictions using both the Ryan and Harleman equation and the proposed equation were similar for conditions for which they were derived, the proposed equations proved to be more accurate over a wider range of thermal loading and fetch length conditions. (Sink-Penn St)
W79-01895

RADIATION AND ENERGY BALANCE OF SPRINKLER AND TRICKLE IRRIGATED FIELDS,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Soil and Water.
For primary bibliographic entry see Field 3F.
W79-01990

2E. Streamflow and Runoff

HYDROLOGIC INTERPRETATION OF BASIN MORPHOLOGY,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 2A.
W79-01899

PARTIAL AREA RESPONSE ON SMALL SEMIARID WATERSHEDS,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
L. J. Lane, M. H. Diskin, D. E. Wallace, and R. M. Dixon.
Water Resources Bulletin, Vol. 14, No 5, p 1143-1158, October 1978. 3 fig, 7 tab, 17 ref.

Descriptors: *Watersheds(Basins), *Semiarid climates, *Runoff, *Infiltrometers, Overlabd flow, Model studies, Erosion, Hydrology, Simulation, *Partial-area response, Semiarid watersheds, Distributed nonlinear model.

Significant errors in estimating surface runoff and erosion rates are possible if a watershed is assumed to contribute runoff uniformly over the entire area, when actually only a portion of the entire area may be contributing. The reported research was directed to develop analysis techniques for partial area response on small arid watersheds. Generation of overland flow on portions of such watersheds was analyzed by 3 methods: an average loss rate procedure, a lumped-linear model, and a distributed nonlinear model. These methods suggested that, on the average, 40 to 60% of the drainage area was contributing runoff at the watershed outlet. Infiltrometer data supported the partial area concept and indicated that the low infiltration zones are the runoff sources as simulated with the distributed nonlinear model. (Singh-ISWS)
W79-01916

IMPACT OF URBANIZATION ON THE HYDROLOGY OF WAIRAU CREEK, NORTH SHORE, AUCKLAND,
Auckland Univ. (New Zealand). Dept. of Geography.
P. W. Williams.
Journal of Hydrology (New Zealand), Vol. 15, No. 2, p 81-99. 1976. 15 fig, 11 ref.

Descriptors: *Urbanization, *Urban hydrology, *Urban sociology, Sediment yield, Floods, Flood frequency, Suspended load, Foreign countries, Foreign research, Effects, *New Zealand, *Auckland(New Zealand), *Wairau Creek(New Zealand), Sediment rating curves.

Hydrological changes that have occurred as a consequence of the urbanization of a small catchment of 11.4 sq km on the North Shore of Auckland were examined. The catchment is developed mainly on relatively impermeable siltstones and fine sandstones. It originally had a cover of subtropical evergreen rain forest, but by 1940 the catchment area was predominantly grassland and scrub. In 1959, almost 3/4 of the catchment was covered in bush, scrub, and grassland, but by 1975 almost 3/4 of the basin was in urban uses. Hydrological records that commenced in 1962 indicated that up to the present the number of small floods contained within the channel have increased 5 times and that the number of large floods has also increased, especially since the channel was lined with concrete. In general, there appears to be an inverse relationship between flood frequency increase and flood magnitude. Flood hydrographs also have changed over the period, becoming much more peaked. Floods now strike more swiftly, rish higher, and run off more rapidly than before urbanization. Sedimentation also has increased. Suspended sediment concentration in storm drainage from a neighboring East Coast Bays residential subdivision attained 59,000 mg/l, which is as high as any concentration ever recorded in New Zealand. In the Wairau Creek catchement, preliminary sediment rating curves were constructed for tributary streams draining areas of different land use. It was concluded that, even when residential areas become established, sediment yield remains unexpectedly high. Silt discharge from the Wairau basin contributes to sedimentation of the estuary at Milford and incurs considerable costs for de-silting the marina. Environmental costs arising from flooding and siltation were estimated, and it was concluded that the costs are not being borne by those that produce them, but are being transferred to the community. (Lee-ISWS)
W79-01922

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01946

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART II. VALIDATION STUDIES,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01947

THE HYDROLOGY OF KARST URBAN AREAS,
Tennessee Valley Authority, Knoxville.
For primary bibliographic entry see Field 2A.
W79-01948

A MANUAL FOR HYDROLOGIC TIME SERIES DESEASONALIZATION AND SERIAL DEPENDENCE REDUCTION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 7C.
W79-01989

2F. Groundwater

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Sciences, London (England).
For primary bibliographic entry see Field 8B.
W79-01503

EXPERIENCE IN ARTIFICIAL GROUNDWATER RECHARGE FOR WATER SUPPLY IN LITHUANIA,
For primary bibliographic entry see Field 4B.
W79-01508

SIMULATION OF FLUID-ROCK INTERACTIONS IN A GEOTHERMAL BASIN,
Systems, Science and Software, La Jolla, CA.
S. K. Garg, T. R. Blake, D. H. Brownell, Jr., A. H. Nayfeh, and J. W. Pritchett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 550, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. NSF-RA-N-75-329, September 1975. 65 p, 11 fig, 26 ref. NSF GI44212.

Descriptors: *Geothermal studies, *Thermal water, *Model studies, *Mathematical models, Heat transfer, Heated water, Temperature, Borehole geophysics, Faults(Geologic), Rocks, Flow, Groundwater, Groundwater movement, Reservoirs, Computers, Porous media, Equations, Analytical techniques, Fluid-rock interactions.

General balance laws and constitutive relations were developed for convective, hydrothermal, geothermal reservoirs. A fully interacting rock-fluid system was considered; typical rock-fluid interactions involved momentum and energy transfer and the dependence of rock porosity and permeability upon the fluid and rock stresses. The mathematical model also included multiphase (water/steam) effects. A simple analytical model was employed to study heat transfer into or from a fluid moving in a porous medium. Numerical results showed that for fluid velocities typical of geothermal systems (Reynolds number much less than 10), the fluid and the solid may be assumed to be in local thermal equilibrium. Mathematical formalism of Anderson and Jackson was utilized to derive a continuum species transport equation for flow in porous media; this method allows one to delineate, in a rigorous manner, the convective and diffusive mechanisms in the continuum representation of species transport. An existing computer program (QUAGMR) was applied to study upwelling of hot water from depth along a fault; the numerical results can be used to explain local temperature

inversions occasionally observed in bore hole measurements. (Sims-ISWS)
W79-01516

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD GROUNDWATER FLOW REGIME,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01522

TRANSIENT TWO-DIMENSIONAL PROBLEMS UTILIZING THE LEAST SQUARES ALGORITHM,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W79-01557

DOLOMITIZATION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Water Resources Research Center.
A. F. Randazzo, and E. W. Hickey.
American Journal of Science, Vol. 278, p 1177-1184, October, 1978. 2 fig, 2 plates, 2 tab, 21 ref. Paper presented at the Second International Symposium on Water-Rock Interaction, Strasbourg, France, 1977. OWRT B-032-FLA(2), 14-34-0001-7148.

Descriptors: *Groundwater movement, *Porosity, *Permeability, *Groundwater resources, *Aquifer management, *Limestones, *Petrography, *Water management, *Aquifers, *Facies, *Diagenesis.

Multiple transgressive-regressive cycles of sedimentation characterize 20 cores penetrating the Floridan Aquifer. Original texture is preserved more frequently in rocks deposited in a supratidal environment and replaced by stoichiometric dolomite. Non-stoichiometric dolomite commonly is associated with obscured or obliterated limestone fabrics. Strontium in both dolomite groups generally is less than 250 ppm and indicates crystallization in a solution less saline than seawater. Dolomitization continued with time as rocks of supratidal and other environments of the area were subjected to repeated lateral migrations of a saltwater-freshwater interface and phreatic groundwaters. (Morgan-Fla)
W79-01749

GEOCHEMICAL INTERPRETATION OF KINGS MOUNTAIN, NORTH CAROLINA, ORIENTATION AREA,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
For primary bibliographic entry see Field 5B.
W79-01912

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN TERRY COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01927

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN YOAKUM COUNTY TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01928

OCCURRENCE AND QUALITY OF GROUND WATER IN BAYLOR COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01929

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN COCHRAN COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01930

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LUBBOCK COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources Austin.
For primary bibliographic entry see Field 7C.
W79-01931

HYDROLOGIC PROBLEMS IN KARST REGIONS.
Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky. 1977. 481 p. Dilamarter, R.R., and Csallany, S.C., editors.

Descriptors: *Conferences, *Karst hydrology, *Karst, *United States, *Groundwater, *Hydrogeology, Subsurface drainage, Land subsidence, Computer models, Model studies, Aquifers, Foreign countries, Foreign research, Water quality, Water wells, Limestones, Carbonate rocks, Caves, Hydrologic aspects, Groundwater movement, Aquifer characteristics, Water supply, Water pollution, Aquifer systems, Groundwater resources, Sinks.

Karst regions - areas underlain by easily dissolved rock such as limestone - generally present unique water-related problems. Water supply and quality, drainage, and general land use problems require approaches that may differ considerably from those used in non-karst areas. The articles in this volume called attention to the close surface-subsurface relationships in karst regions and to a wide array of problems, approaches, study techniques, and possible solutions. Written by individual contributors from the United States and several other countries, the articles ranged in scope from theoretical to applied. Beginning with a general background of karst regions and their relation to hydrologic problems, the articles encompassed some geophysical techniques for study, computer simulation of surface watersheds, karst aquifer investigations, including groundwater flow, wells and water supply, and concluded with problems of water quality and construction. The book can serve engineers, scientists, administrators, planners, and others interested in hydrologic problems in karst regions. (See W79-01933 thru W79-01977) (Humphreys-ISWS)
W79-01932

PROGRESS OF KNOWLEDGE OF HYDROLOGY OF CARBONATE ROCK TERRANES - A REVIEW,
Geological Survey, Reston, VA. Office of the Chief Hydrologist.
V. T. Stringfield,, and J. R. Rapp.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky *University, Bowling Green, Kentucky,* April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, *Kentucky, p 1-9,* 1977. 39 ref.

Descriptors: *Reviews, *Karst hydrology, *Carbonate rocks, Groundwater, History, Groundwater movement, Aquifers, Hydrology, Karst, Limestones, *Greece.

The early theories of water in carbonate rocks related chiefly to the source of movement of the water. The presence of caves, springs, and other karst features in carbonate rocks of Greece and surrounding countries had an influence on the ancient Greek philosophers who attempted to explain the hydrologic cycle. Since the early part of the present century, considerable progress has been made in understanding the hydrology of carbonate rocks, although some investigators still disagree on some features such as the nature of the occurrence and movement of water in these rocks. In the past decade there has been a large increase in interest in carbonate rocks, especially their hydrologic characteristics. That interest is indicated by the rapid increase in the number of investigations of water resources and of environmental problems in carbonate rock terranes. Interest also is indicated by the work at many national and international scientific meetings as shown by the appointment of work groups to study the hydrology of carbonate terranes as part of the International Hydrological Decade and the International Association of Hydrogeologists. The recent literature includes many reports on the results of scientific investigations, glossaries of karst terminology, a comprehensive annotated bibliography of carbonate rocks, and several books on karst. Increased interest in carbonate rock hydrology has caused an increase in some activities such as geochemical and geophysical research, including aerial remote sensing, but research is also continuing along other fronts. Environmental studies of carbonate rock terranes are becoming more urgent as populations and industry continue to expand into these terranes. (See also W79-01932) (Humphreys-ISWS)
W79-01933

KARST HYDROLOGY RELATED TO ENVIRONMENTAL SENSITIVITY,
H. E. LeGrand.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 10-18, 1977. 1 tab, 7 ref.

Descriptors: *Karst hydrology, *Groundwater, *Environment, Hydrological aspects, Karst, Carbonate rocks, Hydrogeology, Paleohydrology, Topography, Environmental problems.

The significant increase in knowledge of karst features and processes of karst hydrology in the past 20 years has not been followed by an equal increase in capability of managing the hydrologic problems in karst regions. Distinctive features of many karst regions include scarcity of soils, scarcity of surface streams, and rugged topography; less distinctive are some highly permeable and cavernous rocks, especially at shallow depths. A characteristic great range in permeability gives rise to many significant problems, including (1) scarcity and poor predictability of groundwater supplies, (2) scarcity of surface streams, (3) instability of the ground, (4) leakage of surface reservoirs, and (5) an unreliable waste-disposal environment. The delicate natural hydrological balances within a karst region can be disturbed easily, and advantages gained by altering the hydrology may be offset by various detrimental effects. A serious handicap in preventing and solving management problems of karst regions is the overall lack of framework for evaluation and study. A growing tendency to concentrate and rely on sophisticated and advanced hydrological techniques at too early a stage may produce results of limited value. Best results are obtained by starting with a basic framework of principles of karst hydrology with which specific available information on the karst setting can be meshed to get useful early approximations. Additional data and inferences in connection with appropriate advanced hydrologic techniques logically follow. A checklist of karst features and hydrologic conditions for use in evaluation of karst hydrology was prescribed. (See also W79-01932) (Humphreys-ISWS)
W79-01934

KARSTIC INSTITUTIONAL CONFLICTS AND OPPORTUNITIES,

Appalachian Regional Commission, Washington, DC. Energy, Environment and Natural Resources Div.
For primary bibliographic entry see Field 6E.
W79-01935

A CONTRIBUTION TO THE STUDY OF THE PROBLEM OF KARST REGIONALIZATION,
Institute for Geological and Geophysical Research, Belgrade (Yugoslavia).
M. Komatina.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 32-40, 1977. 5 fig, 4 ref.

Descriptors: *Karst, *Geology, *Regional development, Foreign countries, Drainage area, Springs, Sinks, Geomorphology, *Yugoslavia.

One of the proper approaches to karst regionalization should be based on the 'geotectonic criterion,' which integrates all geological elements significant for the formation of carbonates and for the development of karstification. The general aspects of regionalization were considered in this light, with reference to hydrogeological features of typical karst regions of the Outer Dinarides of Yugoslavia. The analysis included specific drainage areas within the outer (coastal) and inner karst belts. Regionalization of karst was related to the quantitative treatment of a medium and its water. (See also W79-01932) (Humphreys-ISWS)
W79-01936

KARST TOPOGRAPHY AND ITS OCCURRENCE IN KENTUCKY,
Western Kentucky University, Bowling Green, KY. Dept. of Geography and Geology.
L. D. Whitley.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 41-49, 1977. 2 fig, 11 ref.

Descriptors: *Karst, *Topography, *Kentucky, *Geomorphology, Drainage, Caves, Regional development, Carbonate rocks, Sinks, Shape, Springs.

Selected aspects of karst processes and resulting topography and drainage were reviewed. Solution processes, drainage characteristics, and surface and subsurface topographic features were summarized from existing literature. The interior lowlands of central Kentucky include excellent examples of karst regions. The limestone beds of the area are Carboniferous (Mississippian). In the far north, the limestone is covered by glacial deposits, but in the southwestern portion of the state the limestone is generally covered only by shallow soil. Karst has developed on two distinct landform units. Located in the southwestern portion of this region is the plain known as the Pennyroyal and to the northwest is the Mammoth Cave Plateau, also referred to as the Chester Cuesta. The Dripping Springs (Chester) Escarpment serves as a boundary between the two. On a topographic map this is a very distinctive feature with relief of 65 to 130 m. From the ground it is less noticeable because of dissection that has altered it. In general, the karst area of Kentucky varies a slight degree from one area to another. Landforms in different stages of development may be noted, and the occurrence of caves varies to some degree. Yet, the landforms which are present are unmistakable landforms of karst topography. (See also W79-01932) (Humphreys-ISWS)
W79-01937

REVIEW OF THE PHYSICAL HYDROLOGY OF THE CENTRAL KENTUCKY KARST,
National Park Service, Mammoth Cave, KY. Uplands Research Lab.
J. F. Quinlan, and D. . Rowe.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 50-63, 1977. 6 fig, 18 ref. OWRT A-062-KY(2).

Descriptors: *Karst hydrology, *Kentucky, *Groundwater, *Groundwater basins, Water pollution, Reviews, Karst, On-site investigations, Tracers, Sinks, Limestones, Caves, Aquifers, Groundwater movement, Drainage area, Hydrologic aspects, Stratigraphy, Geology, Drainage system, Subsurface drainage.

The Pennyroyal Plateau in central Kentucky consists of the Sinkhole Plain and the Glasgow Upland - each of which is underlain by Mississippian carbonates that gently dip in directions ranging from north to west. The Sinkhole Plain is flanked on the north by the sandstone-capped Chester Escarpment and Chester Cuesta. The occurrence and movement of groundwater in the Principal Aquifer is traced from the highest recharge area, just beyond the south and east margin of the Sinkhole Plain. Water is found in numerous small swamps of the Glasgow Upland, which feed perennial springs that feed streams that sink at this margin. Water from the swallets flows to cave streams. These low-order tributary streams join intermediate-order tributaries and, finally, a high-order trunk stream that discharges at a major spring along Green River, Barren River, or Little Barren River. The streams that flow beneath the Sinkhole Plain are fed also by runoff into sinkholes and direct infiltration. The streams that drain beneath the Chester Cuesta may be fed not only from the Sinkhole Plain, but also by runoff from ridge tops, infiltration from karst valleys, and by spring discharge from two perched aquifers. Dye-tracing over distances of as much as 24 km has begun to delineate the major groundwater basins. Systematic location of numerous caves and sinkholes in which subsurface streams are intercepted as they flow to their base level outlet, as well as mapping of selected major caves that serve as groundwater conduits, has yielded unique and valuable information about the nature of the dendritic plumbing system that drains the upper part of the Principal Aquifer. Thirteen groundwater basins have been recognized; all but 2 of them are characterized by distributary complexes 50 m to 4 km wide which discharge at 1 or several springs at each of 2 to 14 locations. Only 1 regional spring, Turnhole, lacks a distributary complex. Trunk conduits are commonly as much as 14 m wide. Water levels in them fluctuate as much as 30 m in response to storms. (See also W79-01932) (Humphreys-ISWS)
W79-01938

SUMMARY OF GEOHYDROLOGIC RELATIONSHIPS IN THE LOST RIVER WATERSHED, INDIANA, APPLIED TO WATER USE AND ENVIRONMENT,
Indiana Univ. at Bloomington. Dept. of Geology.
R. V. Ruhe.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, april 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 64-78, 1977. 7 fig, 27 ref.

Descriptors: *Karst hydrology, *Hydrogeology, *Watersheds(Basins), *Indiana, Geomorphology, Sinks, Reviews, Karst, Aquifers, Water balance, Geology, Climate, Hydrology, Hydrological aspects, Water quality, *Lost River(Indiana).

Quantitative relations among surface water and groundwater hydrology and geomorphology and soils were evaluated. Principles were formulated for defining karst-aquifer features that control water balance. Specific goals were to determine the hydrologic system of the karst of the Mitchell Plain of south central Indiana. Study topics include: (1) geomorphology of the karst terrain including surface materials and bedrock topography relative to sinkholes, etc.; (2) soils, including retention and storage capacity, permeability and transmissivity, and ability to enhance runoff; (3) water budget, including runoff, evapotranspiration, subsurface flow, spring flow, subsurface storage, and hydrochemical nature of the water; and (4) water use and environment, including water supply and potential contamination. Sample areas were selected as models for field and laboratory work and fitted to the watershed for quantitative estimate of the whole system. (See also W79-01932) (Humphreys-ISWS)
W79-01939

A PRELIMINARY INVESTIGATION ON SEISMIC TECHNIQUES USED TO LOCATE CAVITIES IN KARST TERRAINS,
Chester Engineers, Inc., Coraopolis, PA. Geotechnical Dept.
K. G. Kirk, and E. R. Snyder.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 79-91, 1977. 12 fig, 7 ref.

Descriptors: *Karst, *Exploration, *Seismic studies, *Subsurface investigations, *West Virginia, Seismology, Geology, On-site tests, Surveys, Seismic waves, Limestones, Instrumentation, Theoretical analysis, Analytical techniques, Seismographs, Data processing, Caves, *Organ Cave(WVA).

Shallow hammer reflection seismology was used in conjunction with a signal enhancement seismograph in an attempt to locate cavities in karst terrains. The use of compressional wave (P wave) reflections and shear (SH) wave reflections was investigated to determine their usefulness in locating cavities. Results indicated that both P and SH wave reflections can be used to locate cavities. The SH wave reflections appear to delineate cavities better than P wave reflections. Success with this technique so far suggests that it can be used as a useful tool in engineering reconnaissance and land use planning. (See also W79-01932) (Humphreys-ISWS)
W79-01940

THE A, B, C'S OF FINDING AND DELINEATING CAVES WITH APPARENT RESISTIVITY MEASUREMENTS,
Monongahela National Forest, Elkins, WV.
T. R. Manley, and E. R. Garton, Jr.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 92-95, 1977. 4 fig.

Descriptors: *Caves, *Karst, *Locating, *West Virginia, Exploration, Methodology, Surveys, Electrical resistivity, Resistivity, Limestones, Analytical techniques.

During investigation into the effects of highway construction on the hydrogeologic environment at Bowden, West Virginia, a technique for finding and delineating limestone caverns from the surface was developed. These caverns are aquifers to the large springs which supply the Bowden National Fish Hatchery with water for all of its operations. The technique use for finding and delineating these caves was apparent resistivity measurements. After interpretation of these measurements, the results were confirmed with boreholes. (See also W79-01932) (Humphreys-ISWS)
W79-01941

GEOPHYSICAL INVESTIGATIONS OVER KARST WATER IN SOUTHEASTERN MISSOURI,
Rhode Island Univ., Kingston. Dept. of Geology.
R. K. Frohlich, and G. P. Smith.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green

Kentucky, p 96-106, 1977. 9 fig, 1 tab, 7 ref. OWRT A-065-MO(2).

Descriptors: *Karst, *Missouri, *Exploration, *Geological surveys, Karst hydrology, Geophysics, Sounding, Electrical studies, Aquifers, Gravity studies, Geology, Resistivity, Surveys, Limestones.

The disappearance of streams and the subsurface transport of water through cavities and stream channels occur frequently in karst terranes. A characteristic area of such phenomena is the southeastern part of Missouri. The disappearance of a small river in this area is believed to be fault-controlled. Geoelectrical depth soundings and gravity investigations produced anomalies, which can be explained by near surface river deposits and the local karst development. The depth soundings after Schlumberger indicate a conductive overburden between 40 and 50 m. No significant change of its thickness profile shows a negative anomaly of -2.0 mgal with a width of nearly 4.5 km. Simplified model calculations consider the external gravity effect caused by the density contrast of karstified versus compact limestone. An almost equal contribution to the gravity anomaly originates from the density contrast of alluvial river deposits versus karstified limestone. The semiquantitative gravity interpretation suggests larger depths of karstification than the thickness of the geoelectrically observed overburden implies. Small-scale limestone dissolutions in the order of 10% can produce substantial gravity lows. However, this would not show on a resistivity depth sounding if the fissures are filled with air or clear water. The gravity survey suggests that extensive karstification occurred near the fault planes. The material, most likley, consists of a weaker rock near the fault than in the surrounding area. The mechanicaly weaker rock is more subject to chemical dissolution when it comes in contact with erosional water. (See also W79-01932) (Humphreys-ISWS)
W79-01942

ALPHA RADIATION MONITORING OF NATIONAL PARK SERVICE ADMINISTERED CAVES IN UNITED STATES,
National Park Service, Santa Fe, NM. Southwest Region.
K. A. Yarborough, and G. M. Ahlstrand.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 107-116, 1977. 1 tab, 6 ref.

Descriptors: *Caves, *Radiation, *Monitoring, *United States, *Public health, Radioactivity, Background radiation, Hazards, Standards, Surveys, On-site investigations, Radioisotopes, Alpha radiation, Radiation exposure, Radon gas, Thoron gas.

The United States National Park Service (NPS) has conducted a preliminary survey of alpha radiation in NPS administered caves. This radiation is produced by the radioactive decay of Radon and Thoron gases, which in turn result from Uranium and Thorium decay. These latter elements are found in all terrestrial rocks and soils in varying, though minute, concentrations. The decay products of the two noble gases which cause a potential health hazard are the short lived 'daughters.' These are solids. This decay yields the alpha radiation which as a large ionizng effect on lung tissues. Continuous exposure of many years (5 or more) may cause lung cancer. Lung cancer has been documented to be anomalously high among uranium miners. Smoking has a contributory effect which greatly increases the radiation health hazard. Health standards are set by several government agencies: Environmental Protection Agency, Occupational Safety and Health Administration, Mining Enforcement and Safety Administration (MESA), and National Institute for Occupational Safety and Health. The NPS research has the dual but complementary objectives: (1) To safeguard health at the NPS administered caves, and (2) To develop data on alpha radiation levels and on natural airflows in caves. The results can be used by various agencies to clarify health standards for exposures to lower radiation levels in cave environments. All persons who spend considerable time underground in caves may be exposed to alpha radiation produced by the radioactive decay of radon and thoron gases. Therefore, underground areas should be monitored for this radiation, and exposures should be computed using the procedures, equipment, and standards of MESA and other agencies as described. (See also W79-01932) (Humphreys-ISWS)
W79-01943

DISTRIBUTION AND DENSITY OF DOLINES IN AREAS OF MANTLED KARST,
Iowa State Univ., Ames. Dept of Earth Sciences.
R. C. Palmquist.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky Univ., Bowling Green, Kentucky, p 117-129, 1977. 8 fig, 2 tab, 16 ref.

Descriptors: *Karst, *Iowa, *Geological investigations, Surveys, Glacial drift, Statistical methods, Analysis, Analytical techniques, Distribution patterns, Spatial distribution, *Dolines, Mantled karst.

The karstic area of Iowa is mantled with drift of Nebraskan, Kansan, and Wisconsinan ages. Ansalysis of doline densities within these drift sheets and of doline distribution within a portion of the Nebraskan drift sheet indicated both temporal and environmental controls. Doline density varies directly with the age of the land surface according to a log age model. This model suggested that doline initiation occurs about 5,000 years after the surface originates with very rapid decrease in the rate of doline initiation occurring about 250,000 years after surface origination. Within two townships in Allamakee County, doline density varies with local environmental controls. Multiple regression analysis indicated that the density of major dolines varies inversely with local relief and extent of surface drainage, but directly with area of Fayette soil. The density of minor dolines varies directly with area of Fayette soil and inversely with local relief. These relationships were interpreted to indicate that the major control on doline density is the amount of groundwater recharge, though for major dolines, aquifer permeability and lithology are also important. (See also W79-01932) (Humphreys-ISWS)
W79-01944

MORPHOMETRIC ANALYSIS OF DOLINES FOR PREDICTING GROUND SUBSIDENCE, MONROE COUNTY, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
A. E. Ogden, and J. P. Reger.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green Kentucky, p 130-139, 1977. 10 fig, 3 tab, 8 ref.

Descriptors: *Karst, *West Virginia, *Land subsidence, *Geomorphology, Subsidence, Limestones, Analysis, Analytical techniques, Geology, Carbonate rocks, Stratigraphy, *Dolines, *Monroe County(W Va), Greenbrier limestone.

Morphometric analysis of dolines shows promise as a useful tool in identifying ground subsidence susceptibility for land use planning. Seven carbonate formations of the Greenbrier limestone group were mapped in central Monroe County, West Virginia, on 7.5-min topographic maps. A doline map was prepared from aerial photographs and transferred to similarly scaled maps. Results indicated different formations with the Greenbrier limestone process relatively distinctive doline distributions. The percentage of limestone area in dolines and the doline density (number of dolines per square mile of limestone are useful indicators of areas of potential subsidence and, furthermore, coincide with total cave footage. The implication is that areas underlain by the most cavernous rock units display the greatest areal and frequency percents of dolines. A ground subsidence susceptibility map, combining areas of optimum hillslope steepness and percent area in dolines, shows those areas considered the most suitable for locating major manmade structures. It was concluded that, in general, the Pickaway limestone is the single most suitable formation upon which to build major structures with minimum risk of subsidence, whereas the Patton and Union formations should be avoided. (See also W79-01932) (Humphreys-ISWS)
W79-01945

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01946

CONCEPTUAL MODELS FOR CARBONATE AQUIFERS: REVISITED,
Pennsylvania State Univ., University Park. Materials Research Lab.; and Pennsylvania State Univ., University Park. Dept. of Geosciences.
W. B. White.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 176-187, 1977. 4 fig, 2 tab, 13 ref.

Descriptors: *Karst hydrology, *Aquifers, *Model studies, *Hydrogeology, *Unsteady flow, Carbonate rocks, Base flow, Groundwater, Geology, Karst, Petrology, Subsurface waters, Flow, Water balance, Hydrographs, Discharge(Water), Perched water, Drainage area.

A conceptual scheme for classifying carbonate aquifers in terms of groundwater flow system and hydrogeologic setting originally proposed in 1969 was revised and extended to include factors of relief, structure, and areal extent of the aquifer. Structural and topographic setting was shown to act mainly through determining the arrangement of karstic rocks with respect to sources of recharge and points of discharge. Lithologic and stratigraphic factors control the degree to which conduit permeability is developed. It was shown that a distinction between diffuse flow (fracture) aquifer systems and conduit flow systems can be made in terms of their response to transient recharge events. The effects of transients is more pronounced in aquifer systems of high relief. The vaue of conceptual classifications is that they permit one to identify particular aquifer types and also indicate some of the variables that should be incorporated into quantitative models of aquifer behavior. (See also W79--6423 and W79-01932) (Humphreys-ISWS)
W79-01949

STORAGE PROPERTIES OF FRACTURED FORMATIONS,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 188-192, 1977. 1 tab, 3 ref.

Descriptors: *Aquifers, *Water storage, *Model studies, *Karst, Mathematical models, Permeability, Porosity, Flow, Equations, Analytical techniques, Fracture permeability, Deformation, Theoretical analysis, Water wells, Pumping.

Response mechanism of a fractured aquifer to a pressure change due to pumping was considered. An aquifer in a state of equilibrium is characterized by a certain form of the stress-strain relationship.

This defines the state of stress within the aquifer, in both the solid skeleton of the rock and the fluid in the voids of the rock. Every change in the state of stress produces a certain change in the stress-strain-time relationship; pore pressure decline causes compression of the rock's skeletal structure and expansion of the fluid contained in the voids, while increase in the fluid pressure causes expansion of the solid skeleton and compression of the fluid. A certain amount of time is required for a new specific stress-strain relationship to occur. A general differential equation for the flow to a well was derived. (See also W79-01932) (Humphreys-ISWS)
W79-01950

FAULTS AS POSITIVE AND NEGATIVE INFLUENCES ON GROUND-WATER FLOW AND CONDUIT ENLARGEMENT,
Texas Univ. at Austin. Dept. of Geological Sciences; and Texas Univ. at Austin. Bureau of Economic Geology.
E. H. Kastning.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 193-201, 1977. 5 fig, 12 ref.

Descriptors: *Karst, *Faults(Geologic), *New York, *Virginia, *West Virginia, *Texas, Flow, Groundwater movement, Hydrology, Base flow, Carbonate rocks, Caves, Aquifers, Fractures(Geologic), Springs, Flow control, Fault zones.

Faults and fault zones within rocks generally are regarded as zones of higher permeability and of greater dissolutional enlargement of conduits than are joints or bedding-plane partings within an aquifer. These views are generally correct. However, recent investigations have indicated that, in some cases, faults have either not influenced karst groundwater flow, or have behaved as insoluble zones, retarding groundwater movement. Faults act as positive influences on groundwater flow where they have increased permeability by increasing fracture density or structurally weakening the bedrock. As negative influences, faults impede groundwater flow at an impermeable fault-plane, divert flow to other hor zons, direct flow along the fault plane, or force waters to surface springs. Futhermore, flow paths have been unaltered by faults in some cases. The effects of faults vary with the structure and texture of the fault surfaces which, in turn, are determined by limestone composition, local pressure-temperature relationships during tectonism, and the nature of compressional or tensional forces during faulting. As no general statement of fault influence on the karst groundwater regime or conduit development can be made, each fault in question must be examined in detail. (See also W79-01932) (Humphreys-ISWS)
W79-01951

MODEL ANALYSIS OF CLOSED SYSTEMS IN KARSTIC AQUIFERS,
Iowa State Univ., Ames. Dept. of Earth Sciences.
Y. Basmaci, and L. V. A. Sendlein.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 202-213, 1977. 7 fig, 1 tab, 19 ref.

Descriptors: *Karst, *Aquifers, *Model studies, *Groundwater movement, Baseflow, Numerical analysis, Computer models, Analysis, Analytical techniques, Mathematical models, Flow, Unsaturated flow, Saturated flow, Steady flow.

Computer simulation of cross sectional models examined the variations in groundwater behavior in karstic terrains using a steady-state groundwater flow equation. This equation is capable of solving flow in unsaturated and saturated media and is thus suitable for karstic models. Adaptation to karstic models requires the consideration of directional permeability of the regolith, effects of point and diffuse discharge, and precipitation. Preliminary results illustrated the interrelationships between granular and solution-channel flow systems. Some of these results were: (1) granular flow patterns prevail as long as vertical permeability approximates horizontal permeability; and (2) topography plays an important role in concentrating pressure head drop along steep slopes. (See also W79-01932) (Humphreys-ISWS)
W79-01952

FLOW TO A WELL IN AN UNCONFINED FRACTURED AQUIFER,
Sheffield Univ. (England). Dept. of Civil and Structural Engineering.
N. S. Boulton, and T. D. Streltsova.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 214-227, 1977. 8 fig, 4 ref.

Descriptors: *Aquifers, *Karsts, *Groundwater movement, *Model studies, *Drawdown, Fissures(Geologic), Flow, Pumping, Water levels, Groundwater, Theoretical analysis, Mathematical studies, Mathematical models, Analytical techniques, Equations, Wells, Water wells.

A new equation was derived for the fissure flow drawdown in a fractured aquifer under water table conditions. The abstraction well, which is pumped at a constant rate, is of full penetration. The fractured aquifer is assumed to consist of the block-and-fissure units. The compressibility of both the porous blocks and their adjoining fissures is taken into account. Flow in the blocks is assumed to be vertical, and flow in the fissures is horizontal. An equation for the flow in blocks was derived. A critical discussion of the theory for the flow of groundwater in fissured rocks was given. (See also W79-01932) (Humphreys-ISWS)
W79-01953

WATER WELL PRODUCTIVITY RELATED TO PHOTO-LINEAMENTS IN CARBONATES OF FREDERICK VALLEY, MARYLAND,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
M. P. LaRiccia, and H. W. Rauch.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 228-234, 1977. 4 fig, 1 tab, 4 ref.

Descriptors: *Karst, *Aquifers, *Water yield, *Surveys, *Maryland, Hydrogeology, Groundwater, Water supply, Limestones, Water wells, Geology, Topography, Surfaces, Analysis, Areal hydrogeology, Specific capacity, Fissures(Geologic), *Frederick Valley(MD), Lineaments, Photo-lineaments.

The effect of photo-lineaments on water well productivity and drawdown was investigated for 65 domestic wells in the Grove and Frederick limestones of Frederick Valley in Frederick County, Maryland. Well information was obtained from Geological Survey data published by the Maryland Geological Survey, while photo-lineaments were mapped on both low altitude and high altitude black and white aerial photographs. Well productivity (both specific capacity and specific capacity index) was found to be significantly higher for pumped wells within 100 feet of a lineament compared with more distant wells, for both the Grove and Frederick limestones. For specific capacity, the near-lineament and off-lineament wells averaged 1.79 and 0.13 gallons per minute per foot of drawdown (gpm/ft), respectively, for the Frederick Limestone, while the Grove Limestone averaged 0.52 and 0.16 gpm/ft, respectively, for near-lineament and off-lineament wells. This indicates that at least short photo-lineaments are usually associated with higher transmissivities in underlying carbonate aquifers, within a zone at least 100 feet in width on either side of a lineament. Such lineaments, therefore, can be used as a prospecting tool for locating high capacity water wells in karst terrains. However, no significant differences in well productivity exist for near-lineament wells with respect to photo-lineament type (stream channel versus tonal-depression), well orientation near a lineament, and nearest lineament orientation. (See also W79-01932) (Humphreys-ISWS)
W79-01954

GROUNDWATER POTENTIAL OF THE KARST REGIONS OF ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
G. Ozoray.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 235-240, 1977. 1 fig, 23 ref.

Descriptors: *Karst, *Canada, *Groundwater potential, *Hydrogeology, Water supply, Aquifers, Limestones, Carbonate rocks, Geology, Water balance, *Alberta(Canada).

The mountain karst of the Cordilleran area (about 17,500 sq km) has a considerable karst water potential, by conservative estimation about 2 cu km annually. The quality of the water is excellent. Presently this potential is unused. Due to increasing demand, a substantial escalation in the use of karst waters is predicted for the near future. Systematic field observation, especially spring yield measurements, are needed to compute a water balance of the mountain karst area. The water of the Athabasca shallow buried karst and that of the deeply buried karst is chemically unsuitable for water supply, although it could be used for medical purposes and as industrial raw material. (See also W79-01932) (Humphreys-ISWS)
W79-01955

GROUND-WATER DEVELOPMENT PROBLEMS ASSOCIATED WITH FOLDED CARBONATE-ROCK AQUIFERS IN THE IRONDALE AREA, ALABAMA,
South Carolina Water Resources Commission, Columbia.
B. C. Springer, and S. L. Graves.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 241-248, 1977. 3 fig, 8 ref.

Descriptors: *Water resources development, *Groundwater resources, *Karst, *Aquifers, *Alabama, Carbonate rocks, Water supply, Subsidence, Water pollution, Geology, Hydrogeology, Folds(Geologic), *Birmingham(Ala).

Carbonate rock aquifers of Paleozoic age are important sources of private, municipal, and industrial water supplies near Birmingham, Alabama. Aquifer contamination, subsidence, local over-development, and well-drilling difficulties are familiar problems associated with Appalachian Valley-type karst aquifers in this area of the folded Valley and Ridge. In and near the City of Irondale, a suburb of Birmingham, southeastward dipping carbonate rocks of Mississippian age supply the majority of groundwater to wells. In 1974, the Bangor Limestone, a shallow unconfined karst aquifer, was contaminated locally with heavy metals resulting in the pollution and abandonment of a municipal well at Irondale. However, a critical water shortage was avoided by the development of the Fort Payne-Tuscumbia, a deeper confined karst aquifer. Since 1969, the Fort Payne-Tuscumbia aquifer has been developed more widely in the Valley and Ridge of Alabama. High-yielded wells, such as the wells at Irondale, have been located and developed in the Fort Payne-Tuscumbia aquifer. The wells provide maximum possible protection against contamination and subsidence. Unfortunately, there are no rules for locating high-yielded wells in folded carbonate-rock aquifers. It is certain, how-

ever, that well-site selection must be a thorough process, and applicable to the local geohydrologic environment. (See also W79-01932) (Humphreys-ISWS)
W79-01956

HYDROGEOLOGY OF A CAVE UTILIZED FOR PUBLIC WATER SUPPLY: RIO CAMUY CAVE, PUERTO RICO, U.S.A.,
Georgia Dept. of Natural Resources, Atlanta. Earth and Water Div.
B. F. Beck.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 249-261, 1977. 6 fig, 33 ref.

Descriptors: *Hydrogeology, *Puerto Rico, *Exploration, *Caves, On-site tests, Groundwater, Water supply, Geology, Karst, Hydrology, Climates, Analysis, Evaluation, Karst hydrology, Public water supply.

The Rio Camuy, one of Puerto Rico's major rivers, originates on the igneous terrain of the Central Mountains and flows north across the offlapping Tertiary limestones with their classic karst development. Where the river reaches the Lares Limestone, it sinks underground and flows through the Rio Camuy Cave System for 7 km, finally reappearing near the contact with the more marly Cibao Formation. Another tributary, a river in the Cueva de Los Angeles, joins the Rio Camuy underground. When measured, flow at the sinking point of the Camuy was 25 cu m/min, and the contribution from Cueva de Los Angeles was 22 cu m/min; but the total flow at the resurgence of the system was 92 cu m/min, indicating a major contribution from more diffuse recharge, or the existence of additional unknown trunk conduits. Portions of the cave are inaccessible, but dye tests and hydrochemical studies have demonstrated most of the connections. Within the karst terrain there is a major municipal water supply near the mouth of the Camuy (3,785 cu m/day) and another moderately large rural supply drawn from a well drilled into the Rio Camuy Cave System. This well is 152 m deep, with 35 cm slotted casing from 125 m to the bottom. It passes through the alluvium of the Rio Camuy within the cave and draws most of its flow from this source. Thus, because of its use for public water supply and because of the high pollution potential proven in karst aquifers, it is important that the details of the karst drainage to the Rio Camuy be accurately known to insure protection of this valuable water resource. (See also W79-01932) (Humphreys-ISWS)
W79-01957

CURRENT PROBLEMS IN THE RATIONAL EXPLOITATION OF KARST WATER,
Institute for Geological and Geophysical Research, Belgrade (Yugoslavia).
B. Mijatovic.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 262-278, 1977. 9 fig, 4 ref.

Descriptors: *Karst hydrology, *Groundwater potential, *Water supply, *Exploitation, Foreign research, Foreign countries, Aquifers, Groundwater, Springs, Discharge(Water), Groundwater resources, On-site investigations, Evaluation, Analytical techniques, Water resources development, *Yugoslavia.

The basic and most difficult problem in supplying water from karstic areas evolves from fluctuations in the quantity of water from large numbers of springs and other flows. This fact requires answers to the questions if an in what manner technical control measures to regulate flows of karstic water for more efficient exploitation can be used. Several Yugoslavian case studies were described, representing examples of circumstances favorable for the application of artificial improvements. Methods for increasing the volume of stored water and for controlling discharge, with better yields, involve such measures as dams, grout curtains, and drainage galleries. It was emphasized that extensive preliminary hydrogeological investigation is essential to the success of projected control measures. (See also W79-01932) (Humphreys-ISWS)
W79-01958

THE DEVELOPMENT AND MANAGEMENT OF KARST WATER RESOURCES IN THE CITY OF PECS AND ITS VICINITY, HUNGARY,
Vizugyi Igazgatosag, Pecs (Hungary).
K. Fekete.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Boling Green, Kentucky, p 279-285, 1977. 7 ref.

Descriptors: *Karst, *Water resources development, *Water supply, *Groundwater, Springs, Caves, Discharge(Water), Management, Foreign countries, Foreign research, Water quality, *Hungary.

The rapidly growing city of Pecs, in southwest Hungary, obtains its water supply from several sources, including the high karst discussed in this paper. High Karst waters are relatively unpolluted and issue from springs in the hills above the city of Pecs and other communities. Two chief problems exist: the potential for pollution; and the wide fluctuation in discharge during the year. A theoretical model aimed at understanding and utilizing the hydrogeological system was attempted, but the model proved to be of limited usefulness. Trial dams were constructed for storing water inside the cave and fracture systems in hope of regulating discharges. The partial success in damming the systems, and problems with unexpected leakage were discussed. Use of a cave system as a natural pipeline was described. It was concluded that the high karst waters are well worthy of protection and utilization. Cave exploration, water tracing, and trial damming are necessary for further understanding of the systems. A dam at a proper site is needed for regulating the discharges. (See also W79-01932) (Humphreys-ISWS)
W79-01959

ARTIFICIAL WORKS AND EFFICIENT INTERCEPTION OF GROUNDWATER IN KARST,
Institute for Geological and Geophysical Research, Belgrade (Yugoslavia).
M. Komatina.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green Kentucky, p 286-296, 1977. 5 fig, 4 ref.

Descriptors: *Karst, *Groundwater, *Water supply, *Water control, Aquifers, Discharge(Water), Water yield, Hydraulic structures, Springs, Hydrogeology, Water quality, Interception, Foreign countries, Foreign research, *Yugoslavia.

An advanced knowledge of karst aquifers and the results of consolidation works in the region of surface reservoirs have suggested new possibilities for a greater utilization of karst water. This paper gave information about new ways in investigation and water interception for Dinaric karst and karst in general, based on artificial works. The known methods gave relatively low safe yield of groundwater, equalling the lowest discharge, while most of the water remained unused. The future concept of an economic groundwater production must be based on works aimed at a correction of natural conditions, above all a control of discharge. The concept of this problem's solution was considered in several examples of inland and coastal karst. Particular attention was given to Orebic and its vicinity, where many experiments and large-scale water-interception works were accomplished in the last 5 years, with notable results. (See also W79-01932) (Humphreys-ISWS)
W79-01960

EXPLORATION AND ENVIRONMENTAL INVESTIGATION OF THE PEACOCK SPRINGS CAVE SYSTEM,
Suwannee River Water Management District, FL.
D. W. Fisk, and I. S. Exley.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Greem, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 297-302, 1977. 3 fig, 4 ref.

Descriptors: *Springs, *Caves, *Exploration, *Florida, *Karst, Water supply, Recharge, Hydrology, Aquifers, Limestones, Groundwater, Groundwater recharge, On-site investigations, Mapping, Hydrogeology, *Peacock Springs(Fla).

Field investigations at the Peacock Springs Cave System in west-central Suwannee County, Florida, revealed the development of an underwater cave system in response to geologic and hydrologic conditions. With over 15,100 feet of surveyed passage, the cave is one of the longest in the Southeast, and is the longest underwater cave surveyed in the United States. In the deeper sections of the cave, flow into the system provides large-scale recharge of the Floridan Aquifer, the main source of potable water in north Florida. Any future development near the springs would represent a threat to not only the integrity of the cave passages, but also to the local ground waters. (See also W79-01937) (Humphreys-ISWS)
W79-01961

ON THE MANAGEMENT OF KARST AQUIFERS IN SAUDI ARABIA,
North Carolina State Univ. at Raleigh. Dept. of Civil Engineering.
A-A. I. Kashef.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 303-312, 1977. 2 fig, 23 ref.

Descriptors: *Karst, *Aquifers, *Water management(Applied), *Groundwater, Sandstones, Aquifer management, Saline water intrusion, Coasts, Springs, Water resources, Management, Water resources development, Foreign countries, *Saudi Arabia.

The coastal areas in eastern Saudi Arabia lie along the Arabian (Persian) Gulf, where sandstone aquifers are deeply buried or nonexistent. The shallow karst aquifers in these areas already have been extensively developed. The recent urbanization and expansion in industry and agriculture dictate the need to explore new water sources and to introduce sound management practices. The Gulf salt water has already intruded deeply in the coastal aquifers. Although a desalination plant is planned in this area, it is believed that, due to ecological factors, the 2 neglected major karst formations should be studied and developed. Furthermore, attention should be given to groundwater management which is not comprehended under the unique and complex political and socioeconomic structure. The paper summarized some of these problems as well as the current hydrologic conditions. Future water requirements were estimated. Conditions in karst regions in other countries were presented for guidance. Various comments were made to improve water resources management and to attract attention to the threatening degrees of salt water intrusion. (See also W79-01932) (Humphreys-ISWS)
W79-01962

HYDROLOGICAL PROBLEMS OF JUFRA WELL FIELD, LIBYA,
Ohio Univ., Athens. Dept. of Geology.

M. U. Ahmad.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 313-322, 1977. 7 fig, 8 ref.

Descriptors: *Aquifers, *Groundwater resources, *On-site tests, *Water supply, Hydrology, Karst, Specific capacity, Deep wells, Water wells, Data collections, Hydrogeology, Geology, Test wells, Analysis, Foreign countries, Foreign research, Drawdown, *Libya.

The Jufra area is located on the boundary of the non-marine Fezzan Basin to the south, the Hamra Basin to the northwest, and the marine Sirte Basin to the northeast. The main aquifer zone at Jufra consists of 45 meters of dolomitic limsetone. Eight wells have been drilled since 1961 near Socna, 15 to 20 kms northeast of Jufra project. In the Socna locality, the Misda aquifer is Upper Cretaceous limestone at a depth of 150-200 meters. This limestone is intensely fractured along the Hun Graben border fault zone. Well capacities are variable and were produced by free flow only. Pressures up to 6.3 atmospheres have been reported. Water composition is fairly uniform between 1300-1700 ppm total dissolved solids. In the Socna Town Hall well, a maximum of 30 meters of drawdown is observed for a total pumpage of 80 million cu M of water. Contractors for the Council of Agricultural Development planned the Jufra Agricultural Project, a farm settlement plan by which 20 wells would irrigate 3,000 hectares. The Misda aquifer would produce 60 million cu M of water per year. The 9 wells drilled to date in the Jufra area have specific capacities 3.6 cu M/HM to 20 cu M/HM, but indicate very high initial transmissivities of 2100 sq M/D and storage coefficient of 0.000087. Time-drawdown graphs showed the effect of fauly boundaries which were located by air photo interpretation. The other consultants have predicted the drawdown after 50 years to be from 30 to 50 meters, ignoring the boundaries and leakage from the deeper aquifer. An attempt to pump 68 million cu M per from the faultefd Misda aquifer may cause serious drawdown in the future. (See also W79-01932) (Humphreys-ISWS)
W79-01963

A MODEL FOR RELATING LAND USE AND GROUNDWATER QUALITY IN SOUTHERN MISSOURI,
Ozark Underground Lab., Protem, MO.
T. Aley.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 323-332, 1977. 5 tab, 6 ref.

Descriptors: *Karst hydrology, *Model studies, *Missouri, *Groundwater, Discharge(Water), Base flow, Water quality, Land use, Land management, Groundwater recharge, Hydrogeology, On-site investigations, Sinks, Springs, Groundwater resources, *Missouri Ozarks.

A hydrologic model was developed for relating groundwater recharge and groundwater discharge in an 1,100 sq mi area in the southern Missouri Ozarks. There are approximately 455,000 acre feet of discrete recharge and 265,000 acre feet of diffuse recharge in the area per year. Mean annual transit water discharge is approximately 200,000 acre feet; mean annual storage water discharge is approximately 520,000 acre feet. The hydrologic model permits land managers and land use planners to recognize relative hazards to the groundwater quality of the area. (See also W79-01932) (Humphreys-ISWS)
W79-01964

HYDROLOGY OF KARST FEATURES IN EVAPORITE DEPOSITS OF THE UPPER PERMIAN IN TEXAS,
Geological Survey, Reston, VA. Water Resources Div.
R. C. Baker.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 333-339, 1977. 4 fig, 7 ref.

Descriptors: *Karst hydrology, *Groundwater, *Texas, Springs, Caves, Saline water, Discharge(Water), Sinks, Hydrogeology, Aquifers, *Permian(Texas), Evaporites.

Rocks of Upper Permian age in west Texas consist largely of red beds, but with interbedded gypsum and salt mostly in the lower part. Water moves downward from the overlying Ogallala formation into the Upper Permian to layers of gypsum; and then by solution and making caves, moves eastward and is discharged at the outcrop area of the gypsum. The vertical movement of the water is facilitated by the collapse of the underlying red beds into the caves. An estimated 10 million kilograms (10,000 tons) of chloride per day is discharged into the Arkansas, Red, and Brazoa Rivers. An understanding of the karst hydrology producing the salt water might be of importance to projects for alleviating the natural contamination. (See also W79-01932) (Humphreys-ISWS)
W79-01965

EVALUATION OF SULFATE WATER QUALITY IN THE NORTH-CENTRAL KENTUCKY KARST,
Bethel Research Association, Louisville, KY.
For primary bibliographic entry see Field 5B.
W79-01966

CHLORIDE ION VARIATIONS IN SOME SPRINGS OF THE GREEN-BRIER LIMESTONE KARST OF WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5B.
W79-01967

ROAD SALTS AND QUALITY OF GROUNDWATER FROM A DOLOMITE AQUIFER IN THE CHICAGO AREA,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W79-01968

HEAVY METAL ADDITIONS TO WATERS OF THE JOPLIN AREA, TRI-STATE MINING DISTRICT, MISSOURI,
Missouri Univ.-Rolla
For primary bibliographic entry see Field 5B.
W79-01969

GROUND WATER POLLUTION OF A LIMESTONE AQUIFER BY CAUSTIC WASTE,
Geological Survey of Jamica, Kingston. Water Resources Div.
For primary bibliographic entry see Field 5B.
W79-01970

EARLY CONFLICTS OVER EFFLUENT IRRIGATION IN MISSOURI'S OZARKS,
Missouri Univ., Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6E.
W79-01971

SUBSURFACE WATER BEHAVIOR AND SEWAGE EFFLUENT IRRIGATION IN THE MISSOURI OZARKS,
Missouri Univ., Columbia, School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W79-01972

INFLUENCE OF KARST ON ENGINEERING IN IRELAND,
Geological Survey of Ireland and Minerex, Ltd., Dublin.
For primary bibliographic entry see Field 8G.
W79-01973

CONSTRUCTION METHODS WHICH RECOGNIZE THE MECHANICS OF SINKHOLE DEVELOPMENT,
Reitz and Jens, Inc., St. Louis, MD.
For primary bibliographic entry see Field 8G.
W79-01974

THE EFFECTS OF HIGHWAY CONSTRUCTION ON THE HYDROGEOLOGIC ENVIRONMENT AT BOWDEN, WEST VIRGINIA,
Bowden National Fish Hatchery, WV.
For primary bibliographic entry see Field 5B.
W79-01975

RESULTS OF TRACING EXPERIMENTS FOR CONSTRUCTION OF RESERVOIRS IN KARSTIC REGIONS,
Technische Hochschule, Graz(Austria). Dept. of Hydrogeology.
For primary bibliographic entry see Field 8E.
W79-01976

USE OF THERMONICS IN FOUNDATION STUDIES IN KARSTIC TERRANE,
Hydrotechnics, Albuquerque, NM.
For primary bibliographic entry see Field 8E.
W79-01977

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 4B.
W79-01992

2G. Water In Soils

TWO-DIMENSIONAL UNSTEADY WATER FLOW IN UNSATURATED POROUS MEDIA,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr.
In: Finite Elements in Water Resources, Edited by Gray, Pinder and Brebbia, Pentech Press, 1977, p. 3.3 - 3.19. 4 fig, 21 ref. (California Water Resources Center Project UCAL-WRC-W-336). OWRT-A-039-CAL(17).

Descriptors: *Finite element analysis, *Unsteady flow, *Groundwater, *Porous media, Unsaturated flow.

Two-dimensional unsteady water flow in unsaturated porous media is a common occurrence in groundwater flow. A finite element weighted residual iteration scheme is presented to solve this type of problem for the water content in the soil. The method presented is general and the results are compared with another published numerical solution to a similar example. The uniqueness of the solution and error estimates for the successive substitution scheme are presented to complete the analysis of the problem. (Snyder-Calif, Davis)
W79-01556

TRANSIENT TWO-DIMENSIONAL PROBLEMS UTILIZING THE LEAST SQUARES ALGORITHM,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr., and R. W. Lewis.
Journal of Heat Transfer, August 1975, p 467-469. 1 fig, 2 tab, 6 ref. (California Water Resources Center Projects UCAL-WRC-W-428) OWRT-A-039-CAL(13).

Descriptors: *Algorithms, *Least squares method, *Finite element analysis, Mathematical studies, Analytical techniques.

The least squares time-stepping algorith, which has previously been shown by the authors to be competitive for one-dimensional problems, is applied to the solution of several two-dimensional examples having constant material properties. The results are compared against answers obtained using recurrence relationships based on the finite element and finite difference methods. Analytical results for one of the examples are also used for comparison. The least squares algorithm proved to be more accurate for equal values of time step especially in the large time step cases. It, however, requires more computer time and storage than the other methods used. Several other limitations of the scheme are also presented. (Snyder-Calif, Davis)
W79-01557

A FINITE ELEMENT WEIGHTED RESIDUAL SOLUTION TO ONE-DIMENSIONAL FIELD PROBLEMS,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, and G. Zyvoloski.
International Journal of Numerical Methods in Engineering, Vol. 6, 1973, p. 577-585. 2 fig, 7 tab, 9 ref. (California Water Resources Center Project, UCAL-WRC-W-336). OWRT-A-039-CAL(5).

Descriptors: *Finite difference method, Mathematical analysis, Numerical analysis, *Unsaturated flow, *Porous media, *Finite element analysis.

The one-dimensional diffusion-convection equation if formulated with the finite element representation employing the galerkin approach. A linear shape function and two-dimensional triangular and rectangular elements in space and time were used in solving the problem. The results are compared with finite difference solutions as well as the exact solution. As another example, the convection term is set equal to zero and these techniques are applied to the resulting heat equation and similar comparisons are made. (Snyder-Calif, Davis)
W79-01558

A FINITE ELEMENT SOLUTION TO A GENERAL TWO-DIMENSIONAL NONSYMMETRIC PARABOLIC PARTIAL DIFFERENTIAL EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, and G. Zyvoloski.
Computers and Fluids, Vol. 3, p. 217-224. 1975, 4 fig, 9 ref. (California Water Resources Center Project UCAL-WRC-W-336). OWRT A-039-CAL(11).

Descriptors: *Finite element analysis, *Mathematical studies, Analytical techniques, *Differential equations, *Galerkin method.

A general solution for a two-dimensional nonsymmetric parabolic partial differential equation is obtained using the Galerkin method in which the weighting function is taken equal to the shape function defining the dependent variable approximation. The solution domain was divided into finite elements having space-time coordinates. The solution technique was applied to the motion of dissolved constitutents in groundwater flow. The results are compared with the analytical and a finite-difference solution to the same problem. The finite element results compared extremely well with the analytical solution and did not display the numerical dispersion problems that occur in the finite difference solution. (Snyder-Calif, Davis)
W79-01559

FINITE ELEMENT SOLUTION OF TWO-DIMENSIONAL UNSTEADY AND UNSATURATED FLOW IN POROUS MEDIA.
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
G. Zyvoloski, and J. C. Bruch, Jr.
In: The Mathematics of Finite Elements and Applications II, edited by J.R. Whiteman, Academic Press, 1976, p. 299-307. 3 fig, 14 ref. (California Water Resources Center Project UCAL--WRC-W-336). OWRT A-039-CAL(16).

Descriptors: *Unsteady flow, *Groundwater, *Porous media, *Finite element analysis, Unsaturated flow.

A finite element weighted residual, successive substitution solution method is given for two-dimensional unsteady and unsaturated flows in porous media. For this type of flow problem, not only the governing differential equation, but also some of the boundary conditions are nonlinear. The technique presented is very general and easy to apply. Within each time step the solution subject to a fixed errors criterion which can be varied from step to step converges quite rapidly. As was seen the nonlinear heat conduction problem was a special case of the general mathematical model and theory. (Snyder-Calif, Davis)
W79-01560

THE USE OF NONIONIC SURFACTANTS ON SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
J. Letey.
In: Soil Conditioners, 1975, Soil Science Society of America, p 145-154. 5 fig, 1 tab, 17 ref. (California Water Resources Center Project UCAL-WRC-W-332). OWRT B-141-CAL(12).

Descriptors: *Surfactants, *Soil water, *Wettability, Plant growth, Penetration, Surface tension, Absorption, *Infiltration rates, Application rates, Plant growth.

Nonionic surfactants lower the surface tension of water and are adsorbed by soil materials. Surfactants can be used to increase infiltration rates of water repellent soils but have not been demonstrated to be effective in increasing infiltration rates of wettable soils. Aggregate stability can be decreased, increased, and unaffected by nonionic surfactant treatment depending upon the surfactant application rate and nature of the soil being treated. Soil modulus of rupture can be decreased by very high surfactant application rates. Relatively low surfactant concentrations detrimentally affect plant growth in solution culture. Only extremely high application rates on soils detrimentally affect plant growth. Plants growing in water-repellent materials can be beneficially affected by surfactant application which improve the soil-water status for plants.
W79-01571

ANALYSIS OF CURRENT LAND-USE AND ZONING VERSUS SELECTED ENVIRONMENTAL FACTORS IN DRAINAGE BASINS CONTAINING LAKES OR PONDS,
Eastern Connecticut State Coll., Willimantic.
For primary bibliographic entry see Field 2H.
W79-01589

ALTERNATE DRYING AND REWETTING EFFECTS ON CHEMICAL AND PHYSICAL PROPERTIES AND MOISTURE-SALINITY RELATIONSHIPS OF A HISTOSOL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
M. Giskin, and I. Levin.
Agronomy Journal, Vol. 70, No. 3, p 445-447, May-June, 1978. 1 fig, 2 tab, 19 ref.

Descriptors: *Organic soils, *Drying, *Wetting, *Soil management, Soil chemical properties, Soil physical properties, Moisture content, *Electrical conductance, *Irrigation, *Histosols, *Saline soils, Salinity.

The purpose of the study was to investigate the possible influences on soil management of changes in chemical and physical properties resulting from a Histosol being carried through several successive dryings and wettings. Soil from the 0 to 30 cm layer of a low moor Histosol with a pH of 7.6 and organic matter content of 55.3% was used. The soil was put through three successive cycle of air-drying and rewetting; subsamples were removed at each stage and physical and chemical determinations were carried out. The saturation percentage of the field sample decreased from 95.9 to 87.3% after the third drying cycle. The electrical conductivity of the saturation extract decreased at each drying stage, due to the large differences in the nitrate content between the dry and wet stages (8 vs. 380 ppm). Moisture retention curve data showed a 5% difference in available water between the moist field sample and the same sample after air-drying. The data showed that laboratory measurements of soil-water relations for a Histosol change with time, i.e., with each exposure to drying and rewetting prior to sampling. This information will have a direct bearing on the management of a Histosol. (Skogerboe-Colorado State)
W79-01699

LINEARIZED MOISTURE FLOW WITH LOSS AT THE SOIL SURFACE,
Arizona Univ. Tucson. Dept. of Soils, Water and Engineering.
D. O. Lomen, and A. W. Warrick.
Soil Science Society of America Journal, Vol 42, No. 3 p 396-399, May-June, 1978. 2 fig, 8 ref.

Descriptors: *Soil water movement, Unsaturated flow, Evaporation, *Moisture content.

The general solution of a linearized moisture flow equation is derived for point and line sources whether buried or on the soil surface. The surface flux is taken to be proportional to the matric flux potential, which is consistent with the physical situation of small evaporative losses for dry soil and larger losses for wet soil. The fraction of water lost at the surface turns out to be identical for point and line sources and for the steady-state case is (m(2+m)) exponent (-alpha d) where m is the surface flux proportionality constant, d the depth of source, and alpha a constant from the assumed unsaturated hydraulic conductivity function. This fraction is plotted as a function of time for a fixed source depth. Also given are curves depicting the total water loss as a function of source depth. A generalized solution is derived for any type of source located in a horizontal plane. (Skogerbor-Colorado State)
W79-01704

NITRAPYRIN DEGRADATION AND MOVEMENT IN SOIL,
Georgia Univ., Experiment. Dept. of Agronomy.
J. T. Touchton, R. G. Hoeft, and L. F. Welch.
Agronomy Journal, Vol. 70, No. 5, p 811-816, September-October, 1978. 5 fig, 5 tab, 13 ref.

Descriptors: *Nitrogen, *Nitrapyrin, *Nitrification, Inhibitors, Degradation(Decomposition), *Ammonium compounds, Ammonia, *Fertilizers, Soil chemical properties, Soil chemical properties, Soil physical properties.

Nitrapyrin (2-chloro-6-(trichloromethyl) pyridine) is applied with ammonium-N fertilizers to control nitrification in soil. However, little information is available on the the persistence or loss of field-applied nitrapyrin. The objective of this study was to monitor movement and degradation of nitrapyrin in soil. Nitrapyrin was applied with anhydrous ammonia in the fall of 1975 and spring of 1975 and 1976. Measurable quatities of nitrapyrin were not found beyond 7.5 cm from the point of release in the soil. The instance that nitrapyrin moved from the point of release in the soil was not affected by nitrapyrin rates. Greater nitrpyrin movement was not detected in one direction from the point of release in the soil than in another direction. Increasing rates of anhydrous ammonia had no effect on nitrapyrin movement of degradation. The most rapid rate of degradation occurred soon after application and decreased with time. The data suggest that nitrapyrin degradation and movement will depend on the physical and chemical characteristics of the soil. Even though degradation rates decreased with time, no indication was found to prove that soil accumulations of nitra-

pyrin will result from once-a-year applications. (Skogeboe-Colorado State)
W79-01706

UTILIZATION OF LABELLED UREA AND AMMONIUM SULFATE BY LOWLAND RICE,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 2K.
W79-01707

ASSEMBLY FOR MOUNTING HYDRAULIC SOIL CORE SAMPLER ON TRACTOR FRONT,
Agricultural Research Service, Stoneville, MS.
For primary bibliographic entry see Field 7B.
W79-01710

AN ANALYSIS OF SENSIBLE AND LATENT HEAT FLOW IN A PARTIALLY FROZEN UNSATURATED SOIL,
Washington State Univ., Pullman. Dept. of Agronomy and Soils.
M. Fuchs, G. S. Campbell, and R. I. Papendick.
Soil Science Society of America Journal, Vol. 42, No. 3, p 379-385, May-June, 1978. 5 fig, 2 tab, 15 ref, 2 append.

Descriptors: *Frozen soils, *Heat flow, Freezing, Thawing, Solutes, *Latent heat, Thermal conductivity.

A heat flow theory has been developed which can be used to predict freezing and thawing cycles of a temperate soil. The latent heat of fusion is incorporated into the classical heat flow equation with the heat capacity and the thermal conductivity of the soil modified to include terms which account for the phase transformation. Computations for a Palouse silt loam soil show that the ice-liquid phase transformation occurs over a defined temperature range where the apparent heat capacity and the apparent thermal conductivity may take on values which are several orders of magnitude larger than those either in the unfrozen or in the near completely frozen soil. The computations also indicate that the presence of solutes in the soil water significantly lowers the temperature range over which the freeze-thaw zone develops and may allow considerable transport of water and heat at lower temperatures than in the absence of solutes. (Skogerboe-Colorado State)
W79-01711

CROP WATER REQUIREMENT IN RELATION TO CLIMATE AND SOIL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
J. Shalhevet, and H. Bielorai.
Soil Science, Vol. 125, No. 4, p 240-247, April, 1978. 2 fig, 4 tab, 22 ref.

Descriptors: *Water requirements, Yield equation, *Climatic data, *Soil properties, Cotton, Sorghum, Grapefruit, Evapotranspiration, Evaporation, Pans, Correlation analysis.

The effect of variation in climate and soil on the production function of water for the yield of cotton, sorghum, and grapefruit was analyzed to determine the transferability of water requirement information, accumulated in Israel, to other regions of the world. A model giving relative yield (Y) as a linear function of relative evapotranspiration (Et/Eo) for all climatic regions together was compared with regional relationships of Y to net water application. Y is the ratio of a treatment yield to the maximum yield obtained in an experiment; Et and EO are the cumulative seasonal evapotranspiration, including a small drainage component, and pan evaporation, respectively. The correlation coefficients were high for field crops but smaller for citrus. About 90 percent of the variability in yield of field crops were attributed to differences in potential evapotranspiration and in irrigation amounts. No effect was found of variations in soil on crop yield due to the rather uniform water-storage capacity of soils of varying texture. It was proposed that the production functions obtained in Israel may be used in regions with similar climatic characteristics for a wide range of soils after accounting for climatic variations through pan evaporation estimates. (Skogerboe-Colorado State)
W79-01712

SIMULATION OF NITROGEN PROCESSES IN SOILS FOR ESTIMATING FERTILIZER REQUIREMENTS,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2K.
W79-01713

FERTILIZATION DECISION MODEL-A SYNTHESIS OF SOIL AND PLANT PARAMETERS IN A COMPUTERIZED PROGRAM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
U. Kafkafi, B. Bar-Yosef, and A. Hadas.
Soil Science, Vol. 125, No. 4, p 261-268, April, 1978. 1 fig, 2 tab, 43 ref, 3 append.

Descriptors: *Fertilization, *Computer models, Plant growth, Nitrates, Nitrogen, Phosphates, Potassium, Ammonium compounds, Nutrient removal, Root development, *Model studies, *Computer programs.

A fertilization decision model was suggested, based on soil and plant parameters. The optimum concentration range of nitrate nitrogen in the soil solution, during the uptake period of the growing plant, was suggested to be 50 to 250 ppm N-NO3 for all soils and plants. The optimum bicarbonate-soluble P was found to vary with plant and soil type, and was determined by response experiments. Percent recovery of added fertilizer by bicarbonate extraction was used to calculate the amount of fertilizer needed to raise the extraction value to the optimum level. Exchangeable potassium was considered to be the only source important during the growing season of an annual crop. The uptake rate of nutrients during the growing season, depth the root penetration, and sensitivity to ammonium were considered to be the main plant parameters. The model calculates, at present time intervals, the balance between the quantity of nutrients in the root zone and uptake by plants. A decision to add fertilizer is made if a deviation from the optimum exceeds a predetermined value. (Skogerboe-Colorado State)
W79-01714

FACTORS AFFECTING GYPSUM AND CATION EXCHANGE CAPACITY DETERMINATIONS IN GYPSIFEROUS SOILS,
American Univ., Beirut (Lebanon). Dept. of Soils and Irrigation.
For primary bibliographic entry see Field 2K.
W79-01716

EFFECT OF NITRAPYRIN ON NITRIFICATION OF FALL AND SPRING-APPLIED ANHYDROUS AMMONIA,
Illinois Univ. at Urabana-Champaign. Dept. of Agronomy.
J. T. Touchton, R. G. Hoeft, and L. F. Welch.
Agronomy Journal, Vol 70, No 5, p 805-810, September-October, 1978. 5 fig, 5 tab, 15 ref.

Descriptors: *Nitrification, Inhibitors, Denitrification, *Nitrates, Fertilizers, *Ammonia fertilizers, Leaching, Timing, Rates of application, Soil types, *Nitrapyrin, *Nitrogen.

Nitrification of ammonium fertilizers in late fall and early spring and subsequent nitrate losses through leaching and denitrification are a continuing economical and environmental concern. To evaluate the effects of nitrapyrin on nitrification, anhydrous ammonia with and without nitrapyrin was applied in the fall and spring to poorly drained soils. Nitrogen and nitrapyrin rates ranged from 0 to 268 and 0 to 1.12 kg/ha, respectively. Detailed sampling from ammonia retention zones was conducted throughout the fall, spring, and summer. Effects of nitrapyrin on nitrification varied with time of application, nitrapyrin rate, and soil type. (Skogerboe-Colorado State)
W79-01717

A METHOD OF PROMOTING PENETRATION OF WATER INTO TIGHT, SLOPING SOIL UNDER DRIP IRRIGATION,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
For primary bibliographic entry see Field 3F.
W79-01719

DETERMINATION OF STABILITY CONSTANTS OF METAL-HUMIC ACID COMPLEXES BY POTENTIOMETRIC TITRATION AND ION-SELECTIVE ELECTRODES,
National Inst. for Environmental Studies, Yatabe (Japan). Water and Soil Environment Div.
For primary bibliographic entry see Field 5A.
W79-01721

THE STATISTICAL MECHANICAL THEORY OF WATER TRANSPORT THROUGH UNSATURATED SOIL. 1. THE CONSERVATION LAWS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito.
Water Resources Research, Vol. 14, No. 3, p 474-478, June 1978. 26 ref. OWRT B-046-ARIZ(8), NSF ENG76-0921.

Descriptors: *Soil water movement, *Theoretical analysis, *Statistical models, *Unsaturated flow, Equations, Statistical methods, Mass, Momentum equation, Continuity equation, Mathematical models, Model studies, *Statistical mechanics, Macroscopic balance equations.

The macroscopic differential equations of mass and momentum balance for water in a rigid unsaturated soil were derived from first principles by using the methods of statistical mechanics. The derivation begins with the development, at the molecular level, of expressions for the mass and linear momentum densities of water in a soil. The derivatives of these expressions with respect to the time then provide for local balance equations that are ensemble averaged and local volume averaged in order to produce the macroscopic balance equations. The resulting macroscopic equations agreed with those derived for mass and linear momentum transport in a soil on the basis of the continuum theory of mixtures. The unified insight into mass transport processes afforded by a statistical mechanical theory as compared to one evolved from a solely macorscopic view was discussed. (See also W79-01725) (Visoky-ISWS)
W79-01724

THE STATISTICAL MECHANICAL THEORY OF WATER TRANSPORT THROUGH UNSATURATED SOIL. 2. DERIVATION OF THE BUCKINGHAM-DARCY FLUX LAW,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
G. Sposito.
Water Resources Research, Vol. 14, No. 3, p 479-484, June 1978. 18 ref. ENG76-09210.

Descriptors: *Soil water movement, *Theoretical analysis, *Statistical models, *Unsaturated flow, Equations, Hydraulic conductivity, Statistical methods, Hydraulic gradient, Mathematical studies, Buckingham-Darcy flux law, Experiments, Linear response theory.

The Buckingham-Darcy flux law, an empirical equation that relates the volumetric flux density of water in an unsaturated soil to the gradient of the total potential, was derived from first principles by using the methods of statistical mechanics. The derivation given, a direct application of well-known techniques in nonequilibrium statistical mechanics, proceeds through a detailed molecular description of two laboratory experiments for measuring the hydraulic conductivity tensor of a homogeneous unsaturated soil. In the first experi-

ment, the steady flow of water is induced by a gradient in the matric potential; while in the second, flow is induced by a gradient in the gravitational potential. In both cases, the appropriate form of the Buckingham-Darcy law was derived on the basis of a linear response approximation, and an expression for the hydraulic conductivity was given in terms of a time integral of the correlation function for the velocities of the water molecules in the soil. The problem of calculating the hydraulic conductivity of soil thereby was reduced to quadrature and to the task of developing a molecular model of the velocity correlation among the water molecules. A recent successful model of this type was discussed briefly. (See also W79-01724) (Visocky-ISWS)
W79-01725

SOME FACTORS AFFECTING DENITRIFICATION IN SOILS IRRIGATED WITH WASTEWATER,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W79-01729

USE OF FECAL STREPTOCOCCI AS INDICATORS OF POLLUTION IN SOIL,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W79-01738

PROFILE MODIFICATION OF A FRAGIUDALF TO INCREASE CROP PRODUCTION,
Missouri Agricultural Experiment Station, Columbia.
For primary bibliographic entry see Field 3F.
W79-01740

RELATIONSHIP BETWEEN SOIL TEST AND SMALL GRAIN RESPONSE TO P FERTILIZATION IN FIELD EXPERIMENTS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 3F.
W79-01786

TRANSPORT OF REACTIVE SOLUTES DURING TRANSIENT, UNSATURATED WATER FLOW IN MULTILAYERED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
H. M. Selim.
Soil Science, Vol. 126, No. 3, p 127-135, September, 1978. 10 fig, 14 ref.

Descriptors: *Solutes, *Unsaturated flow, *Soil water movement, *Mass transfer, Mathematical models, Numerical analysis, Equations, Infiltration, Adsorption, Chemical reactions, Unsteady flow, Model studies, Multilayered soils, Redistribution.

A numerical model was developed to predict water and reactive solute transport through water-unsaturated, mulitlayered soils. An explicit-implicit finite difference approximation method was used to solve the water and solute transport equations simultaneously. Calculated results were presented for two- and three-layered soils during water infiltration and redistribution. Linear and nonlinear equilibrium adsorption, first-order kinetic reaction, and irrversible kinetic reaction were used to describe solute adsorption in individual soil layers. It was found that, for all adsorption mechanisms considered, concentration distributions during infiltration and redistribution was influenced significantly by the order in which the soil layers were stratified. (Visocky-ISWS)
W79-01921

2H. Lakes

'THERMAL POLLUTION' OF BODIES OF WATER AND THE HYDROLOGIC ASPECTS OF THE PROBLEM,
For primary bibliographic entry see Field 5B.
W79-01505

MAJOR ELEMENT GEOCHEMISTRY OF LAKE POWELL,
Dartmouth Coll., Hanover, NH. Dept. of Earth Sciences.
R. C. Reynolds, and N. M. Johnson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 675, Price codes: A02 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No. 5, October 1974. 19 p, 5 fig, 1 tab, 4 ref. NSF GI-34839.

Descriptors: *Geochemistry, *Water chemistry, *Utah, Calcium carbonate, Water quality, Chemical analysis, Chemical properties, Water analysis, Turbidity, Convection, Circulation, Mixing, Inorganic compounds, Water circulation, Currents(Water), Analysis, Thermal stratification, *Major element geochemistry, *Lake Powell(Utah), *Environmental impact assessment.

Chemical studies of Lake Powell indicated that its waters are moderately saline and that their composition is controlled by the relative proportions of contributions from the Green, San Juan, and Colorado Rivers. Ionic species are present in the proportions SO4 more than Ca similar to Na more than Alkalinity more than Mg more than Cl much more than K. Surface waters are oversaturated with respect to calcium carbonate, and salt flux calculations and comparisons of pre-and post-dam bicarbonate concentrations of river water at Lee's Ferry suggested precipitation of calcium carbonate in Lake Powell. Physical studies of the lake showed that it can be classified as warm monomictic; but it possesses meromictic tendencies inasmuch as convective mixing to the bottom does not occur. Despite the lack of deep convective mixing, the bottom waters have not become anaerobic because they are replaced periodically by cold, saline, advective flows from the input at Hite. The lake still possesses much of the character of a river reach in which the water has a long residence time. (Henley-ISWS)
W79-01511

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 7B.
W79-01512

SUMMARY REPORT OF THE PILOT STUDY PROGRAM, GREAT LAKES SHORELAND DAMAGE STUDY,
Corps of Engineers, Chicago, IL. North Central Div.
For primary bibliographic entry see Field 4A.
W79-01528

GREAT LAKES SHORELINE DAMAGE SURVEY, SAINT LOUIS COUNTY, MINNESOTA, APPENDIX I.
Arrowhead Regional Development Commission, Duluth, MN.
For primary bibliographic entry see Field 4A.
W79-01529

GREAT LAKES SHORELINE DAMAGE SURVEY; BROWN, DOUGLAS, AND RACINE COUNTIES, WISCONSIN, APPENDIX II,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 4A.
W79-01530

GREAT LAKES SHORELINE DAMAGE SURVEY; MUSKEGON, MANISTEE, SCHOOLCRAFT, CHIPPEWA, ALCONA, AND HURON COUNTIES, MICHIGAN, APPENDIX III,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01531

ENGINEERING STUDIES FOR A CONTRACT FOR FIELD INVESTIGATION OF HIGH WATER DAMAGE IN OSWEGO COUNTY, NEW YORK, APPENDIX IV,
Saint Lawrence-Eastern Ontario Commission, Watertown, NY.
For primary bibliographic entry see Field 4A.
W79-01532

MEASUREMENT OF COASTAL BLUFF RECESSION FROM AERIAL PHOTOGRAPHS, MUSKEGON COUNTY, MICHIGAN, APPENDIX VII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01533

COMPARISON OF FIELD DATA COLLECTIONS TO DATA COLLECTED USING STUDY INSTRUMENTS IN MUSKEGON AND MANISTEE COUNTIES, MICHIGAN, APPENDIX VIII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01534

EXCHANGE OF CARBON DIOXIDE BETWEEN THE ATMOSPHERE AND LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2K.
W79-01550

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 11. NATURAL AREAS OF THE LAKE MICHIGAN DRAINAGE BASIN AND ENDANGERED OR THREATENED PLANT AND ANIMAL SPECIES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 6G.
W79-01555

ANALYSIS OF CURRENT LAND-USE AND ZONING VERSUS SELECTED ENVIRONMENTAL FACTORS IN DRAINAGE BASINS CONTAINING LAKES OR PONDS,
Eastern Connecticut State Coll., Willimantic.
H. I. Snider, M. Gable, and R. Ferguson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 241, Price codes: A02 in paper copy, A01 in microfiche. Institute of Water Resources University of Connecticut, Starrs, Project Completion Report March 1978. 13 p. 5 tab, 4 ref. OWRT A-068-CONN(1), 14-31-0001-3507.

Descriptors: *Chemistry of lakes, *Land use, Soils, Lake basins, Eutrophication, Water pollution effects, *Zoning, *Drainage basin analysis(Lakes), *Connecticut, Lakes, Planning models.

Land use, soils, and lake water chemistry were studied in 12 lake drainage basins in stern Connecticut. Housing and agriculture are the most prevalent uses of land in the lake watersheds; However, the percentage of use varies substantially. Soil studies were based on Natural Soils Groups which also varied from basin to basin. In general, the most adaptable land for urban development has been the first used for residential subdivision. Further residential intensification, especially on hardpan soils, could become a major factor in eutrophication acceleration and water pollution. The relationship of land use and soils to water chemistry is complex and must consider regional differences in waters prior to examination for change. Eastern Connecticut lakes are mostly soft ad extremely soft

with respect to bicarbonate content. Specific conductivities of lake water range from 34 to 154.4, with a mean median of 62f micromhos/cm. for 76 lakes sampled. An approximation of total dissolved solids in p.p.m. or mg/1 can be made by multiplying specific conductance by 0.63. Major cation and anion dominance vary. 'Original' water dominated by calcium and bicarbonate ions has been changed mainly by addition of sodium and chloride ions.
W79-01589

A PRELIMINARY ECOLOGICAL SURVEY OF DARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
Arkansas Water Resources Research Center, Fayetteville.
For primary bibliographic entry see Field 6G.
W79-01591

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A), APPENDIX A: IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01597

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A) APPENDIX B: THE INFLUENCE OF COLLOIDAL ORGANIC MATTER (COM) UPON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01598

DISTRIBUTION AND PRODUCTION OF SAGO PONDWEED (POTAMOGETON PECTINATUS L.) ON A NORTHERN PRAIRIE MARSH,
Delta Waterfowl Research Station, Portage la Prairie (Manitoba).
For primary bibliographic entry see Field 2I.
W79-01629

WETLANDS OF THE UNITED STATES: THEIR EXTENT AND THEIR VALUE TO WATERFOWL AND OTHER WILDLIFE,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
For primary bibliographic entry see Field 6B.
W79-01635

INVENTORY OF WETLAND HABITAT USING REMOTE SENSING FOR THE PROPOSED OAHE IRRIGATION UNIT IN EASTERN NORTH DAKOTA
South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 3F.
W79-01636

APPLICATION OF LANDSAT IMAGE WETLAND STUDY AND LAND CLASSIFICATION IN WEST TENNESSEE,
Tennessee University Space Inst. Tullahoma. Remote Sensing Div.
For primary bibliographic entry see Field 7B.
W79-01638

THE VERIFICATION OF LANDSAT DATA IN THE GEOGRAPHICAL ANALYSIS OF WETLANDS IN WEST TENNESSEE,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W79-01639

REMOTE SENSING OF WETLANDS,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 7B.
W79-01642

WETLAND PLANT COMMUNITIES ALONG THE EASTERN SHORELINE OF LAKE ONTARIO,
State Univ. of New York at Syracuse. Dept. of Forest Botany.
For primary bibliographic entry see Field 2I.
W79-01644

SUBMERGED VEGETATION OF THE ROTORUA AND WAIKATO LAKES 3. LAKE RERewhakaiitu,
Auckland Univ. (New Zealand). Dept. of Botany.
V. J. Chapman, and J. Clayton.
Hydrobiologia, Vol. 47, No. 3-4, p 399-413, December 1, 1975. 3 fig, 1 ref.

Descriptors: *Submerged plants, *Lakes, *Survey, Rooted aquatic plants, Wetlands, Eutrophication, Light penetration, Plant morphology, Lake Rerewhakaiitu(New Zealand).

The submerged and emergent aquatic macrophyte vegetation of the eutrophic Lake Rerewhakaiitu was surveyed in February-March 1973, and is described qualitatively. At the time the lowered lake level had resulted in producing a sward of normally submerged aquatics as land forms. The principal dominant in the sward is Myriophyllum propinquun, the plants being greatly reduced in length to short stems with single entire leaves. At the uppermost levels Tillaea sinclairii is a significant component of the sward, and at lower levels Lilaeopsis lacustris behaves similarly. Below the uppermost submerged belt of macrophytes there is a characean meadow of Chara fibrosa and C. australis which in deeper waters gives way to Potamogeton ochreatus with either C. australis or Nitella hookeri. The high degree of eutrophication and consequent low light penetration has resulted in a vegetation limit at 4-5-5m, which is lower than that found in other Rotorua lakes. (See also W73-13711 and W73-06489) (Stihler-Mass)
W79-01652

DESIGN WAVE INFORMATION FOR THE GREAT LAKES; REPORT 5, LAKE SUPERIOR,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8B.
W79-01662

PRELIMINARY EVALUATION OF THE WATER QUALITY OF PROPOSED TOWANDA LAKE, KANSAS.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W79-01666

ZOOBENTHOS IN THERMAL DISCHARGE TO WESTERN LAKE ERIE,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5C.
W79-01675

THE PHOSPHORUS STATUS OF THE SEDIMENTS OF THREE EUTROPHIC LAKES IN VICTORIA,
La Trobe Univ., Bundoora (Victoria). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5C.
W79-01697

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM, 2ND YEAR WORK PRODUCT, VOL. VI. PUBLIC PARTICIPATION ACTIVITIES BY LEAGUE OF WOMEN VOTERS, NORTHEASTERN ILLINOIS PLN. COMMISSION, LAKE MICHIGAN FEDERATION.
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
For primary bibliographic entry see Field 6B.
W79-01845

COMPUTING EVAPORATION FOR INLAND WATER BODIES UNDER A VARIETY OF FETCH AND ATMOSPHERIC STABILITY CONDITIONS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2D.
W79-01895

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATIONAL AREA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W79-01900

AN ECONOMIC AND ENVIRONMENTAL EVALUATION OF ALTERNATIVE LAND DEVELOPMENT AROUND NEW HAMPSHIRE LAKES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W79-01904

LAKE SHORE PROTECTION AGAINST WIND-GENERATED WAVES,
Illinois State Water Survey, Urbana. Hydrology Section.
N. G. Bhowmik.
Water Resources Bulletin, Vol. 14, No. 5, p 1064-1079, October 1978. 8 fig, 1 tab, 17 ref.

Descriptors: *Illinois, *Bank stabilization, *Shores, *Lakes, Erosion, Design, Boating, Filters, Gravels, Riprap, Lake shores, Waves(Water), Winds, Hydrology, Hydraulics, *Lake shore protection, Riprap particles.

A method was reported for estimating the height of wind waves in any lake for a given wind condition. Maximum wind speeds from 5 climatological stations in and around Illinois for the period of 1950-1972 were analyzed, and the maximum wind speed for various durations and return periods were presented. Statistical analysis of wind wave data collected from Carlyle Lake indicated that Rayleigh distribution fitted the wave height distribution reasonably well and that the nondimensional energy spectra followed the (f/f sub m) to the minus 5th power rule in the equilibrium range of frequencies. From a consideration of various forces and physical properties of riprap particles and water, a relationship was developed to estimate the stable weight of riprap particles. Practical design criteria wee proposed to stabilize lake shores against wind waves. (Lee-ISWS)
W79-01917

FACTORS AFFECTING SEDIMENT PHOSPHORUS RELEASE IN LQKE CARL BLACKWELL, OKLAHOMA,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5C.
W79-01984

AN UNOBTRUSIVE MEASURE OF THE RECREATIONAL VALUE OF A LAKE,
Augusta Coll., GA.
For primary bibliographic entry see Field 6B.
W79-01986

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W79-01988

THE EFFECTS OF ADVECTION-DIFFUSION PROCESSES ON THE EUTROPHICATION OF LARGE LAKES, A HYPOTHETICAL EXAMPLE: LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W79-01993

A STUDY OF PARAMETER ESTIMATION PROCEDURES OF A MODEL FOR LAKE PHOSPHORUS DYNAMICS,
Wiezmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5C.
W79-01994

2I. Water In Plants

UPTAKE AND TRANSLOCATION OF A NONIONIC SURFACTANT BY BARLEY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
N. Valoras, J. Letey, and J. Osborn.
Agronomy Journal, Vol. 66, May-June 1974, p. 436-438. 6 fig, 1 tab, 7 ref. (California Water Resources Center Project UCAL-WRC-W-332). OWRT-B-141-CAL(10) and B-072-CAL(12).

Descriptors: *Wetting agents, Water repellency, Radioactive assays, *Surfactants(Nonionic), *Barley, *Absorption, *Plant growth.

Experiments were conducted to determine if nonionic surfactants are taken up and translocated by plants growing in solution or soil containing the surfactant. The effect of surfactant on plant growth was concurrently determined. Barley (Hordeum vulgare L.) and the surfactant 14C-labeled Soil Penetrant 3685 were used in the study. Surfactant concentrations in solution ranged from 0 to 300 ppm, and the amount of 14C-labeled surfactant measured in plant shoots increased as the solution concentration increased. There was also a decrease in plant growth as surfactant concentration application increased. Soils were wet with solutions containing 0 to 10,000 ppm surfactant. Surfactant was taken up and translocated from soil systems, but much higher concentrations had to be applied to the soil as compared to solution culture for equal uptake and/or plant damage. Highest concentrations of surfactant occurred in the older leaves and in the tip portion as compared to the base portion of the leaf. Increased plant damage appeared to be associated with increased surfactant concentration in the plant tissue, but a direct cause-and-effect relation could not be established from the study. (Snyder-Calif, Davis)
W79-01563

NONIONIC SURFACTANT EFFECTS ON GROWTH AND POROSITY OF BARLEY ROOTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
R. J. Luxmoore, N. Valoras, and J. Letey.
Agronomy Journal, Vol. 65, Sept.-Oct. 1974, p. 673-675. 2 tab, 12 ref. (California Water Resources Center Project UCAL-WRC-W-332). OWRT B-141-CAL(11).

Descriptors: *Water repellency, *Surfactants, *Intercellular spaces, Porosity, *Root, *Barley, Growth rates.

Nonionic surfactant materials were applied in both solution and soil culture to assess the direct surfactant and the soil-surfactant interaction effects on root dry weight and root porosity (gas space volume per unit root volume) of barley (Hordeum vulgare L.). Plants were grown for 28 days in solution culture with nonionic surfactant Soil Penetrant 3685 up to 100 ppm. Root dry weight was significantly reduced at 40 ppm and was further reduced to 32% of control plant root weight at 100 ppm. Root porosity, determined by the pycnometer method decreased from 13% (control) to 9% with 20 to 80 ppm surfactant. At 100 ppm, porosity was 4.5%. These results suggest that surfactant penetrated the root at concentrations above 20 ppm and caused flooding of intercellular gas spaces. At a high concentrations above 20 ppm and caused flooding of intercellular gas spaces. At a high concentration (> 40 ppm) root growth decreased and the surfactant inhibited root tip meristematic processes. Soil Penetrant was more toxic to roots than water in surfactant and this more toxic than Aqua Gro surfactant in a soil having little water repellency. Adsorption of surfactants by soil reduced the toxicity to roots. In a water repellent soil, root growth at 28 days was greatly enhanced with a 5,000 ppm addition of either Aqua Gro or Water In indicating more favorable soil-plant water relations. In both soils root dry weight was reduced at high surfactant concentration, however, there were no significant effects on root porosity (mean value 5.7%) suggesting that root tip physiology was more affected by surfactants than internal root morphology. (Snyder-Calif, Davis)
W79-01564

THE USE OF NONIONIC SURFACTANTS ON SOILS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W79-01571

DISTRIBUTION AND PRODUCTION OF SAGO PONDWEED (POTAMOGETON PECTINATUS L.) ON A NORTHERN PRAIRIE MARSH,
Delta Waterfowl Research Station, Portage la Prairie (Manitoba).
M. G. Anderson.
Ecology, Vol. 59, No. 1, p 154-160, Winter, 1978. 1 fig, 2 tab, 54 ref.

Descriptors: *Pondweeds, *Potamogeton species, *Ecological distribution, *Standing crops, Soils, Soil texture, Marshes, Phosphorus, Potassium, Fresh water marshes, Rooted aquatic plants, Delta Marsh(Manitoba), Canada, Lake Manitoba.

Physical and chemical parameters of soils and water, measured on 140 sites in the Delta Marsh, Manitoba between May 1973 and September 1974, were compared with presence and dry-weight standing crop of sago pondweed (Potamogeton pectinatus L.) on those sites. Mean comparisons and discriminant function analyses identified water depth, soil texture and maximum and directional exposure to wave action as important variable affecting plant distribution. Multiple regression analyses suggested that water depth, available soil K, available soil P, soil texture and directional exposure, were important factors affecting growth on colonized sites. A greenhouse experiment demonstrated that sago pondweed grew better on Delta Marsh soils that normally supported the plant, suggesting that some specific edaphic adaptations might exist. Within the euphotic zone of the Delta Marsh, sago pondweed distribution was probably most affected by predvailing winds through their influence on soil distribution and turbulence. (Stihler-Mass)
W79-01629

THE PRODUCTION OF PULP FROM MARSH GRASS.
Mississippi State Univ., Mississippi State. Dept. of Zoology.
For primary bibliographic entry see Field 4A.
W79-01630

THE SALT MARSH FLORA OF MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
L. N. Eleuterius, and S. McDaniel.
Castanea, Vol. 43, No. 2, p 86-95, June, 1978. 1 tab, 28 ref.

Descriptors: *Mississippi, *Salt marshes, *Aquatic plants, *Rooted aquatic plants, Ecological distribution, Marshes, Coastal marshes, Tidal marshes, Wetlands.

Vascular plants found in the tidal marshes of Mississippi were collected over an eight-year period with an intense investigation from 1973 to 1976. A list of plants totalling 173 species, representing 53 families, is presented. The general distribution of each species is indicated as being one or a combination of the following: fresh water but occasional low salinity due to inundation by tidal waters, brackish water, saline water, and hypersaline water. (Stihler-Mass)
W79-01632

PREGERMINATION REQUIREMENTS AND ESTABLISHMENT TECHNIQUES FOR SALT MARSH PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
P. K. Falco, and F. J. Cali.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 514, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper D-77-1, 1977. 23 p, 1 fig, 7 tab, 32 ref, 1 append.

Descriptors: *Salt marshes, Marsh plants, *Spoil banks, *Vegetation establishment, *Planting management, Wetlands, Marshes, Halophytes, Coastal engineering, Excavation, Dredging, Grasses, Marsh management, Soil types, Soil properties, Elevation, Salt marsh establishment, Dredge spoil salt marsh, Spartina alterniflora.

Both seeding and transplating have resulted in successful artificial marsh establishment on natural coastal areas and on deposited dredged materials. Establishment appears to be independent of substrate, but long-term growth and survival of salt marsh grasses apparently are dependent upon substrate. Growth regulation appears to be associated with soil physical factors such as percolation, diffusion, drainage, and aeration rather than with the chemical characteristics of the soil. Elevation and hydraulics, which largely determine the periodicity of plat submergence and emergence, appear to control plat distribution and zonation. Since momentum transport is also largely determined by elevation and hydraulics, establishment and growth of salt marsh plants are affected by the bed sheer stress of the substrate. Biological, mechanical, and engineering problems associated with artificial marsh establishment are discussed. Consideration of these problems and the rapid process of natural invasion and colonization of salt marsh plants on properly elevated dredged materials has resulted in the conclusion that emphasis should be placed on the development of equipment and techniques to allow fine control of dredged material elevation. (Steiner-Mass)
W79-01641

WETLAND PLANT COMMUNITIES ALONG THE EASTERN SHORELINE OF LAKE ONTARIO,
State Univ. of New York at Syracuse. Dept. of Forest Botany.
B. A. Gilman.
M.S. Thesis, SUNY College of Environmental Science and Forestry. April 1976. 187 p, 37 fig, 20 tab, 119 ref.

Descriptors: *Wetlands, *Primary productivity, *Distribution patterns, *Lake Ontario, Marsh plants, Biological communities, Ecological distribution, Environmental gradient, Nutrients, Competition, Productivity, Stratification, Campbell Marsh(New York), Black Pond(New York), Vegetational zoning.

Ponded and streamside wetland systems along the eastern shoreline of Lake Ontario have compositional similarities but distinctive productivity, diversity, and zonation patterns. Long-term compositional changes in ponded and streamside wetland systems occur in response to changes in the environmental complex, especially those involving water regime, nutrient enrichment, and the introduction of competitive species. Short-term changes are more readily interpretated as a response to disturbance and are often temporary. Physiognomic zonation is evident among wetland communi-

ties but compositional zonation is present only among steep environmental gradients. Net annual primary production increases as substrate nutrient supply increases, providing the improvement has not resulted from disturbance like detrital movements. A negative relationship exists between net annual primary productivity and diversity suggesting that increases in community complexity comes at the expense of lower primary production. Possible mechanisms that might account for this consistent relationship include temporal spacing of species productivities in the more diverse communities, vegetative stratification, and the role of woody individuals. (Steiner-Mass)
W79-01644

SUBMERGED VEGETATION OF THE ROTORUA AND WAIKATO LAKES 3. LAKE REREWHAKAITTU,
Auckland Univ. (New Zealand). Dept. of Botany.
For primary bibliographic entry see Field 2H.
W79-01652

PRELIMINARY GUIDE TO WETLANDS OF THE WEST COAST STATES; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-055 106, Price codes: A05 in paper copy, A01 in microfiche. Technical Report Y-78-4, April 1978. 95 p, 3 append, 13 fig, 62 ref. Prepared in Environmental Laboratory, USAEWES.

Descriptors: *Wetlands, *Plant populations, *Vegetation, *West Coast states(US).

This guide to the major plant associations and communities found in wetlands within the West Coast States is one of a series of eight such guides, each prepared by a specialist or specialists familiar with the wetlands in the region covered by the guide. The guides are intended for distribution to the various U.S. Army Engineer Districts for use in wetland identification in the implementation of Section 404 of the Federal Water Pollution Control Act Amendments of 1972. The classification system in the guide is intended solely for use in the Section 404 permit program and is not considered a classification system for other purposes. (WES)
W79-01665

RESPONSES OF STOMATA AND WATER, OSMOTIC, AND TURGOR POTENTIALS OF JOJOBA TO WATER AND SALT STRESS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
For primary bibliographic entry see Field 3C.
W79-01909

TEMPERATURE DEPENDENCE OF WATER UPTAKE BY PLANT ROOTS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
F. N. Dalton, and W. R. Gardner.
Agronomy Journal, Vol. 70, No. 3, p 404-406, May-June, 1978. 4 fig, 1 tab, 11 ref.

Descriptors: *Moisture uptake, *Root systems, *Temperature, Solutes, Kinetics, Diffusivity, *Absorption.

The Transport of water through root membranes is described in terms of equations which couple water and solute transport. The solute transport equatin includes active as well as passive uptake. Temperature effects are manifested in the viscosity of water, the osmotic permeability coefficient of the membranes, and the rate constant for the active solute uptake. From standard reaction rate kinetics, reasonable estimates of of the termperature coefficients of these three processes can be made. A genral equation for the effect of temperature on the uptake rate for a given driving force is derived. This difference in flux between live and dead roots is adequately described by the model, indicating the significance of the active component of the uptake process. (Skogerboe-Colorado State)
W79-01910

2J. Erosion and Sedimentation

HYDRAULICS AND STABILITY OF TIDAL INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W79-01519

SEDIMENT CONTROL CONFERENCE, HELD AT HELENA MONTANA ON DECEMBER 15, 1972.
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 4D.
W79-01523

COMPARATIVE STUDIES ON EXTRACTION OF SEDIMENT INTERSTITIAL WATERS: DISCUSSION AND COMMENT ON THE CURRENT STATE OF INTERSTITIAL WATER STUDIES,
Geological Survey, Woods Hole, MA.
For primary bibliographic entry see Field 2K.
W79-01551

SOURCES OF HEAVY METALS IN SEDIMENTS OF THE HUDSON RIVER ESTUARY,
Lamong-Doherty Geological Observatory, Pallisades, NY.
For primary bibliographic entry see Field 5B.
W79-01678

PARTIAL AREA RESPONSE ON SMALL SEMIARID WATERSHEDS,
Agricultural Research Service, Tucson, AZ. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2E.
W79-01916

LAKE SHORE PROTECTION AGAINST WIND-GENERATED WAVES,
Illinois State Water Survey, Urbana. Hydrology Section.
For primary bibliographic entry see Field 2H.
W79-01917

FLUVIAL ADJUSTMENTS TO THE SPREAD OF TAMARISK IN THE COLORADO PLATEAU REGION,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Geological Society of America Bulletin, Vol. 89, No. 10, p 1491-1501, October 1978. 13 fig, 4 tab, 42 ref.

Descriptors: *Shrubs, *Colorado, *Tamarisk, Fluvial sediments, Sedimentation, Flooding, Turbulence, Friction, Islands, Sand bars, Vegetation effects.

Tamarisk, a shrub or low tree that was artificially introduced into the American Southwest in the late 1800's, has spread throughout the Colorado Plateau region by occupying islands, sand bars, and beaches along streams. Historical photographs show that tamarisk spread from northern Arizona to the upper reaches of the Colorado and Green Rivers at a rate of about 20 km/yr. Detailed studies on the Green River in Canyonlands National Park, Utah, showed that the plant has trapped and stabilized sediment, causing an average reduction in channel width of 27%. Photogrammetric analysis of historical ground photography, including photos from John Wesley Powell's 1871 expedition, and recent aerial photographs supplemented by field surveys provided quantitative data. Expanded islands and channel-side bars exhibit allometric relationships as they change, apparently maintaining a balance between turbulence and friction. Overbank flooding is common on the tamarisk-stabilized features. (Lee-ISWS)
W79-01919

SEASONAL VARIATION IN BEACH EROSION AND SEDIMENTATION ON THE OREGON COAST,
Williams Coll., Williamstown, MA. Dept. of Geology.
W. T. Fox, and R. A. Davis, Jr.
Geological Society of America Bulletin, Vol. 89, No. 10, p 1541-1549, October 1978. 13 fig, 1 tab, 23 ref.

Descriptors: *Beach erosion, *Sedimentation, *Oregon, *Seasonal, Waves(Water), Sands, Winter, Summer, Winds, Climates, *Beach profiles, Summer upwelling season, Winter storm season, Barometric pressure.

A study of the relationship between climate and beach erosion was conducted on the Oregon coast from June 1973 through May 1974. The climatic year on the Oregon coast can be divided into 2 major seasons, the summer upwelling season, extending from early April through late September; and the winter storm season, from October through March. The summer upwelling season, dominated by the North Pacific high, is characterized by north winds, coastal upwelling, frequent fog, and low waves. The winter storm season is marked by strong winds, heavy rain, and high waves. During the upwelling season, north winds were 0 to 15 m/s, and waves were 1 to 3 m high. Two sets of sand bars formed in the intertidal zne, advanced up the beach at 1 to 5 m/day, and expanded to the south at 5 to 15 m/day. Topographic maps of the beach and intertidal zone were surveyed at low spring tides at South Beach, Oregon. There was a net deposition of 15,100 cu m of sand on the beach from July 4 through August 12, 1973. In the winter storm season, the wind shifted to the southwest, increased to 22 m/s, and waves reached more than 5 m in height. Sand was stripped from the beach by longshore currents and backwash from waves during storms and returned to the beach in large bars between storms. The total volume of sand involved in the exchange was about 54,000 cu m or 110 cu m per linear meter of beach. (Lee-ISWS)
W79-01920

PHYSICAL, CHEMICAL, AND MINERALOGICAL PROPERTIES OF FLUVIAL UNCONSOLIDATED BOTTOM SEDIMENTS IN NORTHWESTERN OHIO,
Ohio Agricultural Research and Development Center, Wooster. Dept. of Agronomy.
G. J. Wall, L. P. Wilding, and N. E. Smeck.
Journal of Environmental Quality, Vol 7, No 3, p 319-325, 1978. 5 fig, 5 tab, 16 ref.

Descriptors: *Bottom sediments, *Physical properties, *Chemical properties, *Mineralogy, *Ohio, *Water quality, Sediments, Clays, Heavy metals, Water pollution sources, Suspended load, Pollutants, Soil erosion, Unconsolidated sediments, Analytical techniques, *Clay mineralogy, *Sediment origin, *Heavy metal enrichment, *Mineralogical properties, *Maumee River(Ohio), Suspended sediment.

Fluvial unconsolidated bottom sediments that have the potential to become part of the suspended sediment load in the Maumee River Basin, Ohio, range in texture from sandy loams to clays. Particle size analysis by water dispersion and electrolyte dispersion procedures revealed that an average of 34% of the total clay fraction was aggregated into the silt and sand-sized range, indicating that the coarser fraction of bottom sediments may be physically-chemically active. The 2- to 50-micrometer fraction was dominated by quartz with secondary amounts of mica, kaolinite, feldspars, and carbonates. Mean calcite, dolomite, and calcium carbonate equivalent values were 4.1, 3.4, and 7.8%, respectively. Calcite dissolution in transport is probable on the basis of observed calcite-dolomite ratios. Organic matter content of the fluvial bottom sediments (3 to 7%) was analogous to Lake Erie bottom sediments and Maumee River suspended sediments. CEC values ranged from 39 to

55 meq/100 g for the total clay fraction collected by electrolyte and water dispersion procedures. Enrichment of heavy metals of bottom sediments over surficial soil materials occurred for Cu, Ni, Zn, Ca and Pb by factors of 1.6, 2.0, 2.3, 3.5, and 3.0, respectively. Traces of herbicides (atrazine, 2-4-D) and insecticides (DDT metabolites, endosulfan) were detected in the filtered stream water samples and bottom sediment materials. Downstream trends in selected physical, chemical, and mineralogical properties could not be related to increased urban influences or increased stream discharge. (Henley-ISWS)
W79-01926

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART I. MODEL STRUCTURE,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01946

FACTORS AFFECTING SEDIMENT PHOSPHORUS RELEASE IN LQKE CARL BLACKWELL, OKLAHOMA,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 5C.
W79-01984

CONTEMPORARY AND HISTORICAL TRACE METAL LOADINGS TO THE SEDIMENTS OF FOUR LAKES OF THE LAKE WASHINGTON DRAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01985

2K. Chemical Processes

PROBLEMS IN AUTOMATING THE MONITORING OF SURFACE WATER CHEMISTRY,
Hydrochemical Inst., Novocherkassk (USSR).
For primary bibliographic entry see Field 5A.
W79-01507

MAJOR ELEMENT GEOCHEMISTRY OF LAKE POWELL,
Dartmouth Coll., Hanover, NH. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W79-01511

THE ADSORPTION OF CHROMIUM (VI) AT THE OXIDE/WATER INTERFACE,
Air Force Civil Engineering Center, Kirtland AFB, NM.
For primary bibliographic entry see Field 5B.
W79-01514

PART I: APPLICATION OF PULSE POLAROGRAPHY AND PULSE ANODIC STRIPPING TO THE DETERMINATION OF SELECTED HEAVY METALS IN NATURAL WATERS--PART II: APPLICATION OF CONTROLLED POTENTIAL COULOMETRIC TECHNIQUES TO THE DETERMINATION OF URANIUM,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 5A.
W79-01517

GEOCHEMISTRY OF GROUND WATER, SOUTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W79-01535

EXCHANGE OF CARBON DIOXIDE BETWEEN THE ATMOSPHERE AND LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
R. R. Weiler.
J Fish Res Board Can. 31(3), p 329-332, 1974.

Descriptors: *Atmosphere, Canada, *Carbon dioxide, Di, Exchange, *Lake Ontario, Primary production, Storm, Winter, Air-water interfaces.

The calculated flux of CO2 between Lake Ontario (USA, Canada) and the atmosphere ranged from about 0.1 gC m-2 day-1 during the summer to about 3 during a winter storm. During the summer, the amount of C supplied from the atmosphere was from 5-30% of the estimated amount utilized in primary production. Also Lyman's dissociation constants for carbonic acid were found applicable to the carbonate system of the lake.--Copyright 1974, Biological Abstracts, Inc.
W79-01550

COMPARATIVE STUDIES ON EXTRACTION OF SEDIMENT INTERSTITIAL WATERS: DISCUSSION AND COMMENT ON THE CURRENT STATE OF INTERSTITIAL WATER STUDIES,
Geological Survey, Woods Hole, MA.
F. T. Manheim.
Clays and Clay Minerals, Vol 22, p 337-343, 1974. 2 fig, 3 tab, 36 ref.

Descriptors: *Connate water, *Sediments, *Oceans, Methodology, Chemical analysis, Analytical techniques, Evaluation, Sampling, Core drilling, Subsurface waters, Water types, Pore water, Sea water, *Deep sea core drilling.

The implication by Murthy and Ferrell (1972) that interstitial water studies are in a confused state is critized on the basis that the authors have not drawn on a considerable body of data, especially Soviet studies since the 1950's, and results of the Deep Sea Drilling Project. Pressure filtration systems for extracting interstitial waters are currently the methods of choice for marine studies and have achieved substantial reliability and reproducibility. Although gaps and problems remain, many aspects of interstitial composition of marine sediments have been clarified; these include the substantial constancy of composition of interstitial waters in deep sea pelagic deposits, depletion of interstitial cations owing to authigenic mineral formation in more rapidly accumulated (especially terrigenous) sediments, and special phenomena in sediments overlying salt deposits. (Woodard-USGS)
W79-01551

TRICKLE-BED REACTOR PERFORMANCE, PART 1: HOLDUP AND MASS TRANSFER EFFECTS,
California Univ., Davis. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W79-01565

TRICKLE-BED REACTOR PERFORMANCE, PART II: REACTION STUDIES,
California Univ., Davis. Dept. o
For primary bibliographic entry see Field 5D.
W79-01566

MASS TRANSFER IN PACKED BEDS WITH TWO-PHASE FLOW,
California Univ., Davis. Dept. of Chemical Engineering.
S. Goto, J. Levec, and J. M. Smith.
Industrial Engineering Chemistry Process Design and Development, Volume 14, No. 4, 1975, p 473-478. 10 fig, 1 tab, 16 ref. (California Water Resources Center Project UCAL-WRC-W-392). OWRT A-051-CAL(4).

Descriptors: *Mass transfer, *Flow rates, Coefficients, *Trickle beds, *Two-phase flow, Liquid flow rates, Gas flow rates, *Gas-to-liquid mass transfer.

Mass transfer coefficients were measured at 25C and 1 atm for concurrent liquid (water) and gas flow in beds of small particles (0.054-0.29 cm) of napthalene and CuO-ZnO. The coefficients for transfer between particle and liquid are not greatly different for the three arrangements: upflow, downflow (trickle bed), or liquid full. At high gas rates and low liquid rates upflow gives somewhat higher transport rates, while trickle beds are favored over liquid-full operation at high liquid rates. Desorption of oxygen was measured to obtain liquid-to-gas coefficients when mass transfer in the liquid phase controlled interphase transport. For downflow such coefficients were independent of gas flow rate, but in upflow liquid-to-gas coefficients increased with gas rate. Upflow gave higher coefficients at high gas and liquid rates. Desorption of napthalene from water to air was employed to evaluate the gas-side coefficient in liquid-to-gas transfer for trickle-bed operation. The results showed a high sensitivity to gas flow rate and a modest sensitivity to liquid rate. (Snyder-Calif, Davis)
W79-01567

MEASUREMENT OF TOTAL ORGANIC CONCENTRATION IN WATER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 5A.
W79-01600

UTILIZATION OF LABELLED UREA AND AMMONIUM SULFATE BY LOWLAND RICE,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
K. R. Reddy, and W. H. Patrick, Jr.
Soil Science Society of America Journal, Vol. 42, No. 3, p 465-467, May-June, 1978. 4 tab, 4 ref.

Descriptors: Stable isotopes, *Ureas, *Ammonium compounds, Nitrogen, Fertilizers, Fertilization, *Rice, Flood irrigation.

The objective of this investigation was to compare labelled ammonium sulfate and urea in their effect on yield and N utilization in field microplots on Crowley silt loam (typic albaqualf). Nitrogen was applied as an early season topdressing or as a midseason topdressing and the grain and straw yield and recovery of labelled and native N in the grain straw, and soil were measured. No significant differences in grain and straw yields were observed for the two sources and two times of N application. Ammonium sulfate and urea did not differ significantly in N utilization by the crop. For both sources the recovery of labelled N in the soil-plant system was highest (34 to 55 kg N/ha) in the plots receiving early season topdressing (30 to 38 kg N/ha). More native soil N was taken up by the plants during 1976 as compared to the 1975 season. (Skogerboe-Colorado State)
W79-01707

SIMULATION OF NITROGEN PROCESSES IN SOILS FOR ESTIMATING FERTILIZER REQUIREMENTS,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
G. Kruh, J. Hagin, and S. Sharon.
Soil Science, Vol. 125, No. 4, p 255-260, April, 1978. 3 fig, 2 tab, 19 ref.

Descriptors: Fertilization, Computer models, *Simulation analysis, *Cotton, Ammonium compounds, *Nitrates, Soil moisture, Crop response, Timing, *Fertilizers, Model studies.

In a field experiment on cotton, ammonium sulfate was applied to give 60, 120, and 180 kg N/ha, all in winter, early spring, and late spring applications. A check treatment was included. Soil samples to a depth of 120 cm were taken from time to time, and moisture and nitrate concentrations were meas-

ured. The early spring fertilization at the two lower levels of application produced higher yields than the two other application times. With a maximum at the 120-kg N/ha level. The highest level of application induced a yield depression. The early spring application produced a nitrate distribution in the soil profile with a peak in the 20-40 cm depth. The yield results were partially explained by the nitrate distribution in the soil profile during the early growth period. A computer program simulated well, within experimental errors, the nitrate distribution in the soil profile. It was concluded that such a program could improve considerably nitrogen fertilizer requirements and timing predictions. (Skogerboe-Colorado State)
W79-01713

FACTORS AFFECTING GYPSUM AND CATION EXCHANGE CAPACITY DETERMINATIONS IN GYPSIFEROUS SOILS,
American Univ., Beirut (Lebanon). Dept. of Soils and Irrigation.
A. H. Sayegh, N. A. Khan, P. Khan, and J. Ryan.
Soil Science, Vol. 125, No. 5, p 294-300, May, 1978. 4 fig, 15 ref.

Descriptors: *Cation exchange, *Gypsum, Calcium, Magnesium, Sodium compounds, Ammonium compounds, Soil profiles, Particle size, Soils(Gypsiferous).

Profiles of gypsiferous soils from the Euphrates basin of Iraq and Syria were studied. Increasing fineness of grinding, from 10, 50, 100, and 170 to 270-mesh, increased the measured amounts of gypsum and soluble Ca + Mg. These variables also increased as the soil:water ratio increased i.e., 1:50, 1:100, and 1:500. Cation exchange capacity values at 10, 100, and 270-mesh sizes were determined by various procedures: 1N NaOAC/NH4OAC solutions prepared with distilled water and with 1:1 water-acetone mixture; pretreatments of the soil with 2N BaCl2.2H2O, saturated Na2C2O4, and saturated (COOH)2.2H2O by shaking for variable periods up to six days. After each pretreatment, CEC was determined by the conventional NaOAC/NH4OAC procedure. Highest values were obtained after pretreatment, the order being Na2C2O4, BaCl2.2H2O, and (COOH)2.2H2O. Values increased with time of shaking during pretreatment and with increasing fineness of particle size. Criteria are presented for determining gypsum and CEC in soils containing significant amounts of gypsum. (Skogerboe-Colorado State)
W79-01716

DETERMINATION OF STABILITY CONSTANTS OF METAL-HUMIC ACID COMPLEXES BY POTENTIOMETRIC TITRATION AND ION-SELECTIVE ELECTRODES,
National Inst. for Environmental Studies, Yatabe (Japan). Water and Soil Environment Div.
For primary bibliographic entry see Field 5A.
W79-01721

SOLAR PHOTOLYSIS OF WATER,
R. A. Frosch, and P. R. Ryason.
U.S. Patent No. 4,105,517, 7 p, 3 fig, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 727, August 8, 1978.

Descriptors: *Patents, *Wate properties, *Chemical properties, Hydrogen, Oxygen, Solar radiation, Photolysis, *Photo-oxidation reaction.

A cyclic process for the solar photolysis of water includes a first stage in which water is reduced in the presence of a Eu+2 photo-oxidizable reagent producing hydrogen and spent oxidized Ru+3 reagent. The spent reagent (Eu+3) is reduced by means of a transition metal ligand complex reductant, *RuL+3 in a photoexcited state, such as a ruthenium pyridyl complex. Due to competing reactions between the photolysis and regeneration products, the photo-oxidation reaction must be separated from the regeneration in space and time by supporting the reagent and/or the reductant on solid support and utilizing pH, wavelength and flow control to maximize hydrogen and oxygen production. (Sinha-OEIS)
W79-01883

ARSENIC LEVELS IN THE SURFACE AND GROUND WATERS ALONG WHITEWOOD CREEK, BELLE FOURCHE RIVER, AND A PORTION OF THE CHEYENNE RIVER, SOUTH DAKOTA,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W79-01897

TRANSPORT OF REACTIVE SOLUTES DURING TRANSIENT, UNSATURATED WATER FLOW IN MULTILAYERED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 2G.
W79-01921

DEVELOPMENT OF A NEW TECHNIQUE FOR THE ANALYSIS OF PESTICIDES IN WATER,
Kentucky Water Resources Research, Inst., Lexington.
For primary bibliographic entry see Field 5A.
W79-01981

2L. Estuaries

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY,
Alabama Univ., University. Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 4A.
W79-01510

EFFECTS OF CONSTRUCTION OF LIBERTY STATE PARK ON HYDRAULIC CHARACTERISTICS OF NEW YORK HARBOR; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W79-01518

HYDRAULICS AND STABILITY OF TIDAL INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W79-01519

THREE-DIMENSIONAL FLOW SIMULATION IN ESTUARIES,
Rand Corp., Santa Monica, CA.
J. J. Leendertse, and S-K. Liu.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 100, Price codes: A02 in paper copy, A01 in microfiche. June 1975. 14 p, 8 fig, 5 ref.

Descriptors: *Model studies, *Estuaries, *Chesapeake Bay, *Flow, Mathematical models, Fluid mechanics, Analytical techniques, Numerical analysis, Currents(Water), Velocity, Diffusion, Equations, Tides, Tidal effects, Water temperature, Finite element analysis, Heat balance, Salt balance, Salinity, Three-dimensional flow.

The described model was based upon numerical integration of the flow equations which simulate the water movements caused by tides, wind, and pressure differences, and upon numerical integration of the advective diffusion equation representing the movements of salt and temperature. The model neglects vertical accelerations, but not vertical velocities, and includes an approximation for the sub-gridscale effects by introduction of mass and momentum exchange coefficients. These coefficients are dependent upon the Richardson number and vertical velocity gradients. The computation method was tested on an estuary, and the results of the simulations were presented in graph form. The three-dimensional flows in estuaries with nonisotropic density distributions can be computed effectively according to the finite difference method described. The model requires coefficients used in describing the small-scale mass and momentum exchanges. These coefficients must be found experimentally from field data. (Humphreys-ISWS)
W79-01524

FLOATING BREAKWATERS: AN IDEA WHOSE TIME HAS RETURNED,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W79-01525

FLOATING BREAKWATER FIELD ASSESSMENT PROGRAM, FRIDAY HARBOR, WASHINGTON,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W79-01526

COMPARATIVE STUDIES ON EXTRACTION OF SEDIMENT INTERSTITIAL WATERS: DISCUSSION AND COMMENT ON THE CURRENT STATE OF INTERSTITIAL WATER STUDIES,
Geological Survey, Woods Hole, MA.
For primary bibliographic entry see Field 2K.
W79-01551

SURVEY OF ORDERS OF CONDITIONS (UNDER WETLANDS PROTECTION ACT) OF THE CONSERVATION COMMISSIONS OF CAPE COD, 1973-1977.
Association for the Preservation of Cape Cod, Orleans, MA.
For primary bibliographic entry see Field 6E.
W79-01631

THE SALT MARSH FLORA OF MISSISSIPPI,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 2I.
W79-01632

TECHNIQUES FOR SAMPLING SALT MARSH BENTHOS AND BURROWS,
Georgia Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 7B.
W79-01634

USE OF LANDSAT DATA TO RELATE WATER DEPTH TO OBSERVED AREA OF INUNDATION IN COASTAL MARSHES,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 7B.
W79-01637

PREGERMINATION REQUIREMENTS AND ESTABLISHMENT TECHNIQUES FOR SALT MARSH PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 2I.
W79-01641

COMBINED TEMPERATURE-SALINITY EFFECTS ON GRASS SHRIMP,
California Univ., Davis. Dept. of Land, Air and Water.
For primary bibliographic entry see Field 5C.
W79-01645

PRESERVING THE HERITAGE OF GASPARILLA ISLAND, AN APPROACH TO CONSERVATION OF THE ECONOMIC, CULTURAL,

HISTORICAL, AND NATURAL RESOURCES OF THE ISLAND,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6G.
W79-01646

ELITE ATTITUDES TOWARD MARSHLANDS IN SOUTH CAROLINA,
South Carolina Sea Grant Program, Charleston.
For primary bibliographic entry see Field 6B.
W79-01648

INLAND LAND USE ACTIVITIES AND GEORGIA'S COASTAL WATERS.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 4C.
W79-01651

A COMPARISON OF PLANT SUCCESSION AND BIRD UTILIZATION ON DIKED AND UNDIKED DREDGED MATERIAL ISLANDS IN NORTH CAROLINA ESTUARIES,
North Carolina Univ. at Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01659

NUMERICAL SIMULATION OF TIDAL HYDRODYNAMICS, GREAT EGG HARBOR AND CORSON INLETS, NEW JERSEY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
H. L. Butler.
Technical Report H-78-11, June 1978. 138 p, 5 append, 76 fig, 5 tab, 15 ref.

Descriptors: *Inlets(Waterways), *New Jersey, *Tidal hydrodynamics, *Navigation channels, *Great Egg Harbor, Inlet(NJ), *Corson Inlet(NJ), *Numerical simulation.

Great Egg harbor Inlet and Corson Inlet, located in southeast New Jersey, have been plagued with hazardous navigation conditions and erosion problems. Numerical techniques were used to investigate the tidal hydrodynamics of the inlet complexes for existing conditions and for proposed improvement plans. Physical size and complex geometry of the study areas required a simulation model that could be economically applied. Consequently, and inherent part of the study involved development of a numerical model (WI model) based on an implicit finite difference formulation. The model includes treatment of moving boundaries and subgrid-scale barriers. A comparison study with a well-known explicit finite diference tidal model was performed to assure the implicit model's reliability and cost effectiveness. The WI model was then applied to Great Egg Harbor and Corson Inlets to quantitatively predict the tidal hydrodynamics (exclusive of salt and sediment transport) for existing conditions and various improvement plans. Results indicate the systems proposed for Corson Inlet appear to function equally well and no detrimental effects were noted. For Great Egg Harbor Inlet, a concentration of ebb flow toward the upcoast deposition basin and structure was noted, suggesting a potential problem which should be recognized for the proposed plans. (WES)
W79-01661

PRELIMINARY GUIDE TO WETLANDS OF THE WEST COAST STATES; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2I.
W79-01665

LEAD ACCUMULATION RATES IN TISSUES OF THE ESTUARINE TELEOST FISH, GILLICHTHYS MIRABILIS: SALINITY AND TEMPERATURE EFFECTS,
Scripps Inst. of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5C.
W79-01667

STREPTOCOCCUS SP. FROM MARINE FISHES ALONG THE ALABAMA AND NORTHWEST FLORIDA COAST OF THE GULF OF MEXICO,
Auburn Univ., AL. International Center for Aquecultures.
For primary bibliographic entry see Field 5C.
W79-01698

STUDIES ON THE MYTILUS EDULIS COMMUNITY IN ALAMITOS BAY, CALIFORNIA: VII. THE INFLUENCE OF WATER-SOLUBLE PETROLEUM HYDROCARBONS ON BYSSAL THREAD FORMATION,
California State Univ., Long Beach. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01701

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-01750

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 1, BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Programs.
For primary bibliographic entry see Field 5C.
W79-01811

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 2. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continenta Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01818

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL. 3. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administrations, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01822

RECONNAISSANCE OF THE INTERTIDAL AND SHALLOW SUBTIDAL BIOTIC LOWER COOK INLET,
Dames and Moore, Homer, AK.
For primary bibliographic entry see Field 5C.
W79-01824

APPLICATIONS OF MIXING EXPERIMENTS TO ESTUARIES,
Johns Hopkins Univ., Baltimore, MD.
R. R. Long.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 221, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings of the Speciality Conference on 'Civil Engineering in the Oceans/III,' American Society of Civil Engineers, June 9-12, 1975, University of Delaware, Newark, p 1400-1419. 6 fig, 28 ref. ONR N00014-75-C-0805.

Descriptors: *Estuaries, *Mixing, *Mathematical models, *Froude number, *Saline water-freshwater interfaces, Salinity, Critical flow, Tidal waters, Fjords, Density stratification, Model studies, Two-layer models, Richardson number.

The paper first considered estuarine circulations in deep, two-layer, fjord-type estuaries, ignoring the details of the mass distribution and the circulations in the main body of the estuary and concentrating on the flow conditions and interface depth in the vicinity of the mouth. The flow near the mouth was considered to be frictionless and the pressure hydrostatic, and the first part of the analysis assumed strong mixing. Phenomena in this state are functions of a non-dimensional number Q sub f proportional to the freshwater influx. On the other hand, the problem is also solvable when the mixing is zero. The two extreme cases suggest a simple dependence on a mixing number M for arbitrary mixing. This permits a complete solution for the ocean water flux, brackish water flux, depth of the interface at the mouth, salinity of the brackish water, depth of the halocline in the main body of the estuary, and height above sea level of the free surface in the estuary, all as functions of Q sub f and M. The second part of the paper presented a complete solution for flow conditions and mass distributions in a deep, two-layer rectangular estuary. Mixing occurs across the interface, and friction is a dominant factor. The interface slopes downward toward the mouth, reaching a maximum depth at a certain section. Beyond this, the interface rises. At the mouth, where by definition the width of the estuary increases rapidly, it was found that there must be a transition from subcritical to supercritical flow. The solution is determined by the freshwater influx per unit width, the turbulent velocity, the estuary length, and the buoyancy of seawater. (Adams-ISWS)
W79-01911

ON THE EXCITATION OF EDGE WAVES ON BEACHES,
California Inst. of Tech., Pasadena. Dept. of Applied Mathematics.
A. A. Minzoni, and G. B. Whitman.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 523, Price codes: A02 in paper copy, A01 in microfiche. Report No. 39, June 1977. 15 p, 3 tab, 11 ref, 1 append. Reprint from Journal of Fluid Mechanics, Vol. 79, Part 2, p 273-287, 1977. ONR N00014-75-C-0702.

Descriptors: *Waves(Water), *Ocean waves, *Beaches, *Model studies, Mathematical models, Equations, Mathematics, Theoretical analysis, Shores, Coasts, Edge waves, Nonlinear waves.

The excitation of standing edge waves of frequency 1/2 omega by a normally incident wave train of frequency omega was discussed previously on the basis of shallow water theory. In this paper, the problem was formulated in the full water wave theory without making the shallow water approximation and solved for beach angles Beta=pi/2N, where N is an integer. The work confirmed the shallow water results in the limit N much greather than 1, showed the effect of larger beach angles, and allowed a more complete discussion of some aspects of the problem. (Sims-ISWS)
W79-01914

SEASONAL VARIATION IN BEACH EROSION AND SEDIMENTATION ON THE OREGON COAST,
Williams Coll., Williamstown, MA. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W79-01920

MICROSTRUCTURE OF AGGLOMERATED SUSPENDED SEDIMENTS IN NORTHERN CHESAPEAKE BAY ESTUARY,
South Carolina Univ., Columbia. Dept. of Geology.
C. F. Zabawa.
Science, Vol. 202, p 49-51, October 6, 1978. 3 fig, 39 ref.

Descriptors: *Sediment, *Suspended load, *Turbidity, *Chesapeake Bay, Sedimentary petrology, Mineralogy, Coagulation, Flocculation, Electro-

chemistry, Plankton, Benthic fauna, Estuaries, Microstructure, Pelletization.

Suspended sediments in the turbidity maximum of Chesapeake Bay include composite particles which contain platy mineral grains, arranged both in pellets (attributable to fecal pelletization) and in networks of angular configuration (attributable to electrochemical flocculation and coagulation). (Visocky-ISWS)
W79-01923

EFFECTS OF NUTRIENT ENRICHMENT OF A SALT MARSH ON DIATOM COMMUNITIES,
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01982

WAVE FORCES ON CAUSEWAY-TYPE COASTAL BRIDGES,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01983

MARINE ALGAL VEGETATION IN SHALLOW WATER AROUND THE DANISH ISLAND OF SALTHOLM, THE SOUND,
Institut for Sporeplanter, Copenhagen(Denmark).
For primary bibliographic entry see Field 5C.
W79-01996

NITROUS OXIDE IN THE OXYGEN MINIMUM OF THE EASTERN TROPICAL NORTH PACIFIC: EVIDENCE FOR ITS CONSUMPTION DURING DENITRIFICATION AND POSSIBLE MECHANISMS FOR ITS PRODUCTION,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W79-01997

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

PARAMETRIC STUDY AND PRELIMINARY EVALUATION OF REVERSE OSMOSIS FOR SEAWATER DESALINATION,
Oak Ridge National Lab., TN.
P. Glueckstern, S. A. Reed, and J. V. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-TM-5231, Price codes: A04 in paper copy, A01 in microfiche. Report No. ORNL/TM-5231, November 1976. 54 p, 9 fig, 9 tab, 11 ref, 3 append. W-7405-eng-26.

Descriptors: *Desalination, *Reverse osmosis, *Computer models, *Optimization, Flash distillation, Costs, Comparative costs, Sea water, Economics, Computer programs, Membrane processes, Multistage flash distillation, Costs, Comparative costs, Treatment, Operating costs.

Results of a parametric study are presented of one- and two-stage reverse osmosis for (RO) systems desalination of sea water are presented. Optimization of RO systems was approached using a recently developed computer program which applied membrane manufacturers' performance data and predicted costs. Based on these data and other equipment and operating costs, a preliminary evaluation of the economics of reverse osmosis for sea water desalination was made. Plant capacities in the range of 1 Mgd were considered and compared economically with the current most common multistage flash (MSF) distillation process at different energy price levels. It was concluded that reverse osmosis desalination plants are competitive with MSF plants in the 1-Mgd range and, if projected technology is realized, in the 2.5-Mgd range. However, it is evident that reverse osmosis cannot compete with dual purpose MSF plants. (Majtenyi-IPA)
W79-01580

WATER REQUIREMENTS AND DESALTING IN THE UNITED STATES OF AMERICA,
M. V. Hughes, Jr.
Desalination, Vol. 21, p 301-307, 1977. 9 fig, 1 tab, 8 ref. Based on a talk presented February 23, 1977. the Technology Transfer Conference, Desalting State-of-the Art Review, Reston, VA.

Descriptors: *Desalination, *Water resources, *Water utilization, *Water requirements, *Projections, Data, Irrigation, Recycling, Water pollution control, Water quality, Water demand, Water reuse, Planning, Brackish water, Desalination plants, Water sources.

The impact of U.S. water requirements on the need for desalination is discussed using data from preliminary figures of the 1975 Water Assessment of the Water Resources Council. A great potential for increases in desalination is predicted because of the large and increasing water requirements for industrial, municipal, and energy uses. Principal locations of U.S. desalination plants and their capacities are tabulated and the type of usage in relation to capacity is expressed graphically. Irrigation is discussed in detail because it is the largest consumer of water with about 80% of the 1975 consumption. In addition, increased salinity due to irrigation return flows places additional burdens on water resources. Increases in industrial consumption and higher standards for treating waste water indicate that desalination will be used increasingly in the future. The reuse of water and turning to brackish and ocean water to supplement scarce local supplies of fresh water will require additional desalination facilities. (Majtenyi-IPA)
W79-01582

FORWARD OSMOSIS EXTRACTORS: THEORY, FEASIBILITY AND DESIGN OPTIMIZATION,
Arizona Univ., Tucson. School of Renewable Natural Resources.
C. D. Moody.
Available from National Technical Information Service, Springfield, VA, 22161 as PB-289 251, Price codes: A07 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1977. 135 p, 18 fig, 6 tab, 52 ref, 6 append. OWRT B-053-ARIZ(4), 14-34-0001-7137.

Descriptors: *Osmosis, *Desalination, *Membrane processes, Separation, Cost analysis, Concentration polarization, Reclamation, Agriculture, Irrigation, Greenhouses, *Optimization, *Forward osmosis.

Osmosis occurs when two solutions of differing osmolar concentrations are separated by a membrane permeable to the solvent but not to the solutes. In osmosis, water flows spontaneously from the low concentration source solution to the high concentration driving solution. Forward osmosis is examined as a low-technology, low-energy use processes for hydration and dehydration of aqueous solutions. The fundamental mechanical device is a continuous counterflow extractor which incorporates a semipermeable membrane separating the source and driving solutions. The counterflow design permits maximum water recovery from the source solution and maximum dilution of the driving solution. The nonlinear differential equations describing the water and solute flows in the extractor are solved using analytical and numerical techniques. The resulting mathematical models contain design equations which can be used to determine the optimum membrane transport charcteristics, optimum membrane size, and the asymmetric membrane orientation which minimizes concentration polarization. Theoretical and experimental results compare well. Two applications discussed in detail are the production of potable water from seawater using human nutrients, and fertilizer-driven forward osmosis (FDF) for converting saline water to irrigation water.
W79-01592

MUNICIPAL WATER SUPPLY SYSTEM,
J. L. Rugh, II.
U.S. Patent No. 4,102,752, 4 p, 1 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1604, July 25, 1978.

Descriptors: *Patents, *Desalination, *Desalination plants, *Potable water, Domestic water, Water purification, Water treatment, Nuclear reactors, Nuclear powerplants, Temperature.

A municipal water supply system provides potable water under pressure from seawater and includes a nuclear reactor heated boiler for raising the temperature of sea to at least 250F and at superatmospheric pressure. The superheated steam is conveyed to an expansion turbine where the steam drives a turbine while the temperature of the steam is reduced to about the boiling point of water at atmospheric pressure. A heat exchanger condenses the exhaust from the turbine while simultaneously preheating incoming sea water to the system. Liquid pumping means driven by the expansion turbine for conveying the condensed water under pressure to a municipal distribution are provided. Additionally, are provided for controlling the temperature within the boiler chamber by controlling the volume of incoming sea water. (Sinha-OEIS)
W79-01863

TREATMENT OF AQUEOUS SYSTEMS,
CIBA GEIGY Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 8G.
W79-01887

3B. Water Yield Improvement

DEVELOPMENT AND EVALUATION OF IMPROVED FILMS FOR SUPPRESSING WATER EVAPORATION,
Arizona State Univ., Tempe. Dept. of Chemical Engineering.
C. O. Reiser, and T. J. Ruhoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 230, Price codes: A02 in paper copy, A01 in microfiche. University of Arizona, Tucson, Water Resources Research Center, Project Completion Report, July 1978. 15 p, 5 fig, 1 tab, 9 ref, append. OWRT A-061-ARIZ(1). 14-31-0001-5003.

Descriptors: *Evaporation control, Wave suppression, *Monomolecular films, Chemical films, *Water conservation.

A small water-wind tunnel with an air passage 0.24 m high by 0.22 m wide and 6.5 m long over a water layer 7 cm deep has been used for the dynamic testing of surface films for evaporation control. Differences in the entering and exit humidity were determined at air speeds up to 11 m/sec when feeding water suspensions of resistant films at the tunnel entrance. At the conditions used, long-chain alcohol films with 16 to 20 carbons mixed with 10% of a C18 monoethoxylate gave about 50% evaporation reduction and were about twice as effective as multilayer films containing linoleic acid polymerized with polyvinyl alcohol. Wave dampening above 11 m/sec (24.5 mi/hr) is difficult and no significant difference in wave suppression was observed between these two types. Further investigations using this equipment, which models natural conditions, are needed to develop more wind-resistant films in an effort to commercialize a promising method of water conservation.
W79-01537

REDUCING PHREATOPHYTE TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. C. Davenport, and R. M. Hagan.
In: Hydrology and Water Resources in Arizona

and the Southwest, Vol. 6, April-May, 1976, p. 141-146. 2 fig, 4 tab, 6 ref. OWRT C-6030-(No. 5325) (2).

Descriptors: *Antitranspirants, *Transpirants, *Riparian water loss, Tamarisk, Cottonwoods, *Phreatophytes, *Transpiration rates, Plant transpiration, Water conservation, Water yield improvement.

Transpiration rates (T) of riparian phreatophytes can be high. Antitranspirant (AT) sprays can curtail T without ecological imbalance made by eradication. Saltcedar (Tamarix sp.) and cottonwood (Populus sp) in 15-gal. drums enabled replicated trials on isolated plants or on canopy. T for a unit ground area of saltcedar varied from 2.2 (sparse-) to 15.8 (dense-stand) mm/day in July at Davis. Extrapolation of experimental T data to field sites must, therefore, be made carefully. Wax-based ATs increased foliar diffusive resistance (R), and reduced T of slatcedar and cottonwood 32-28% initially and 10% after 3 weeks. R increased naturally in the afternoon when evaporative demand was high and if soil water was low. Nocturnal T of salt cedar was 10% of day T. AT effectiveness increased with a higher ratio of day: night hours, and with lower soil water stress. Therefore, AT will be most effective on long summer days in riperian areas where ground water is available. (Snyder-Calif, Davis)
W79-01562

A NONDESTRUCTIVE APPROACH TO REDUCING RIPARIAN TRANSPIRATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. C. Davenport.
In: Riparian Forests in California, Their Ecology and Conservation Institute of Ecology, University of California, Davis Publication No. 15, May 14, 1977, p 103-110. 1 fig, 1 tab, 39 ref. OWRT C-6030(No. 5235)(3).

Descriptors: *Riparian plants, *Riparian land, *Transpiration, *Antitranspirants, Plant transpiration, Phreatophytes, Water conservation, Water yield improvement.

The continuous availability of ground water to riparian phreatophytic vegetation results in large transpiration losses to the atmosphere. These are most significant in summer when high transpiration rates coincide with peak demands for ground- and stream-water. While complete eradication of riperian vegetation can increase stream flow, it can also cause undesirable physical (e.g., erosion) and ecological (e.g., to wildlife) disturbances. On the other hand, spraying a non-destructive antitranspirant (e.g., a wax-based emulsion) on riparian vegetation can reduce transpiration, by over 50% in lab. tests and 30% in field tests, with no phytotoxicity. This alternative to eradication is being tested as a means of improving ground and surface-water supplies with minimum risk of environmental damage. (Snyder-Calif, Davis)
W79-01586

METHOD AND MEANS OF TREATING WATER WELLS,
Moran (Thomas L.), Amarillo, TX. (Assignee).
D. M. Paul.
U.S. Patent No. 4,103,743, 6 p, 3 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 141, August 1, 1978.

Descriptors: *Patents, *Water wells, *Water sources, *Water yield improvement, Water supply, Combustion, Acids, Artificial recharge, *Water pollution treatment.

A method and means for chemically treating water wells to increase the production is described. Liquid chemical, usually acid, is initially placed in the well through the water discharge conduit of the well head or pump apparatus. Compressed air is initially forced into the interior of the column pipe in the casing to sense the depth of the water so that pressure sensitive gauges in the circuitry may be set according to the water depth. Compressed air is then forced into the column pipe to force some of the water into the water bearing formation. A combustible mixture of air and gas is then introduced into the upper end of the column pipe and ignited so that the force of combustion expels the water and acid in the casing through the slits in the well casing into the water bearing formation. The heated bases of combustion cool rapidly and the combustion step is repeated approximately 200-300 times over a period of approximately three hours. The heat of combustion increases the temperature of the water and acid to approximately 108F which enhances the action of the acid. The impact of combustion also tends to loosen or break any encrustation which is present in the water bearing formation. The well is then pumped for approximately 2 to 3 hours to remove the acid and residue. (Sinha-OEIS)
W79-01871

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 4B.
W79-01992

3C. Use Of Water Of Impaired Quality

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01543

INVESTMENT PLANNING FOR COLORADO RIVER SALINITY CONTROL,
California Univ., Los Angeles. Graduate School of Management; and California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5G.
W79-01587

ALTERNATE DRYING AND REWETTING EFFECTS ON CHEMICAL AND PHYSICAL PROPERTIES AND MOISTURE-SALINITY RELATIONSHIPS OF A HISTOSOL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel).
For primary bibliographic entry see Field 2G.
W79-01699

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan.
R. J. Hanks, T. E. Sullivan, and V. E. Hunsaker.
Soil Science Society of America Journal, Vol. 41, No. 3, p 606-610, May-June 1977. 5 fig, 6 tab, 9 ref. OWRT C-5189(No. 4233)(1), B-121-UTAH(1).

Descriptors: *Corn(Field), *Crop response, *Salinity, Soil moisture, *Irrigation effects, Evapotranspiration, *Crop production, *Alfalfa.

Yields of corn and alfalfa were determined where both salinity and water stress were imposed. Yields of corn at Logan, Utah in 1975 were decreased by salinity or water stress (caused by low irrigation levels) in direct relation to the decrease in evapotranspiration. The decrease in evapotranspiration was caused by a decrease in soil water depletion, indicating that salinity influenced soil water availability. Corn yields at Vernal, Utah in 1974 were decreased by salinity, but to a considerably lesser extent by low irrigation, probably because of water flow upward into the root zone from a water table. Alfalfa yields at Vernal in 1974 were not decreased by salinity or by low irrigation rates, because of water supplied by a water table and used by roots below the zone of salinity. (Skogerboe-Colorado State)
W79-01734

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-01735

EVALUATION OF NITRAPYRIN AS A MEANS OF IMPROVING N EFFICIENCY IN IRRIGATED SANDS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 3F.
W79-01847

TESTING SALT TOLERANCE VARIABILITY AMONG TALL WHEATGRASS LINES,
Agricultural Reseach Service, Riverside, CA. Salinity Lab.
M. C. Shannon.
Agronomy Journal, Vol. 70, No. 5, p 719-722, September-October, 1978. 1 fig, 3 tab, 22 ref.

Descriptors: *Wheatgrasses, *Salt tolerance, Varieties, Variability, *Plant breeding, Plant physiology.

In the present study a screening procedure was evaluated to determine its usefulness in detecting variation among introductions of tall wheatgrass (Agropyron elongatum (Host) Beauv). In greenhouse sand flats, 32 lines of tall wheatgrass were established and subjected to stepwise increases in sainity up to 765 meq/liter or until severe lead damage resulted. The lines were classified into five groups based on relative leaf damage and recovery rates from salt treatment. Repeating the screening procedure of seven each of the most tolerant and most sensitive lines reaffirmed the results of the first screening. Mineral analyses indicated that tolerance was associated with restricted accumulation of Na, Ca, and Cl in the shoots. Proline and soluble sugars contributed to osmotic adjustment at high salinities, but sensitive and tolerant lines did not differ in proline content. This screening technique appeared to discriminate between lines with different ion transport properties and different salt tolerances. The sensitivie and tolerant lines identified may be beneficial in future breeding and physiological studies. (Skogerboe-Colorado State)
W79-01879

RESPONSES OF STOMATA AND WATER, OSMOTIC, AND TURGOR POTENTIALS OF JOJOBA TO WATER AND SALT STRESS,
California Univ., Riverside. Dept. of Soil and Environmental Sciences.
J. A. Adams, F. T. Bingham, M. R. Kaufmann, G. J. Hoffman, and D. M. Yermanos.
Agronomy Journal, Vol. 70, No. 3, p 381-387, May-June, 1978. 4 fig, 2 tab, 42 ref.

Descriptors: *Desert plants, Soil-water-plant relationships, *Salt tolerance, *Drought tolerance, *Turgidity, Transpiration, *Stomata, Xylem, *Jojoba.

Jojoba (Simmondsia chinensis (Link) Schneider) is a desert shrub which can provide a much needed substitute for sperm whale oil. Because of the absence of soil-plant-water data for jojoba and the limited amount of such information for desert plants in general, selected plants were water-and-salt-stressed in greenhouse soil and sand culture experiments. Responses of leaf water, osmotic, and turgor potentials to stress and associated stomatal behavior were studied. (Skogerboe-Colorado State)
W79-01909

3D. Conservation In Domestic and Municipal Use

EFFICIENCY AND EQUITY IN PRICING LOCAL PUBLIC SERVICES: THE CASE OF WASTEWATER,
Wisconsin Univ.-Madison. Dept. of Agricultural

Economics.
For primary bibliographic entry see Field 5D.
W79-01544

A LAND STUDY FOR DOWNTOWN LAKE CHARLES,
Houston Univ., TX. Coll. of Architecture.
For primary bibliographic entry see Field 6B.
W79-01838

INNOVATIVE MANAGEMENT CONCEPT FOR 208 PLANNING,
Michigan Univ., Ann Arbor. Civil Engineering and Natural Resources.
For primary bibliographic entry see Field 5G.
W79-01848

SYSTEMATIC DEVELOPMENT OF INSTITUTIONAL AND LEGAL PRESCRIPTIONS FOR URBAN WATER USE AND MANAGEMENT,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W79-01891

WATER CONSERVATION IN THE LAS VEGAS VALLEY: PRICING AND ALTERNATIVE MEASURES,
Nevada Univ. System, Reno. Water Resources Center.
D. K. Lyon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 373, Price codes: A03 in paper copy, A01 in microfiche. Publication No. 41056, 1978; 33 p. 1 fig, 8 tab, 52 ref. OWRT A-085-NEV(1), 14-34-0001-8030.

Descriptors: Water demand, Water resources, *Water costs, *Economics, *Water conservation, *Pricing, *Nevada, *Las Vegas Valley(Nev), *Alternative costs, Alternative water use, Forecasting(Population), *Metering.

Economic literature on water conservation is reviewed. Two methods appear to be most promising: metering and pricing. Marginal versus average cost pricing is discussed. Pricing analysis is applied to the study area, Las Vegas Valley, NV. Several population forecasts are used to estimate future water demand. Unless population grows at the highest anticipated rate, present water supplies should be sufficient to the year 2000. The role of energy in supplying water in the Las Vegas Valley is also discussed. Price of water will be affected as energy prices increase and become a large percentage of the total cost of water. Consumer response to increase in price of water is usually to decrease consumption, thereby postponing, at least for a short while, the need for new water supplies for the area. A policy of water conservation will also result in energy conservation. Areas in need of further research are outlined.
W79-01896

THE ROLES OF WATER CONSERVATION VALUES IN COMMUNITY POLICY,
Colorado State Univ., Fort Collins.
R. W. Snodgrass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 608, Price codes: A10 in paper copy, A01 in microfiche. MA Thesis, 1977, 205 p, 15 fig, 21 tab, 83 ref. OWRT A-030-COLO(2).

Descriptors: *Cities, *Planning, *Water supply, *Conservation, *Water conservation, Direct reuse, Water consumption, *Community development, *Colorado, Louisville(Colo), Lafayette(Colo).

Employing a Q-Sort Factor Analytical Design, this study sought to develop a system for parametric representation of nonlinear data structures using data acquired from representative samples of entire communities. The representations are specified in terms of a spatial metric 'social space', an analogue of psychological space. The defined social space is then characterized and used to define the community action zone which is hypothesized to a zone of community acceptance for those policies falling within its bounds. Such a zone for the communities of Lafayette and Louisville, Colorado was used to define socially and politically feasible water conservation policies for the communities. Policies with the highest feasibility for acceptance were legal restrictions on water use and restrictions on growth and development. The next most feasible were horitcultural techniques and economic solutions. Reuse for agricultural purposes also appeared to have some political feasibility. This study demonstrated the usefulness of survey research in delineating viable water conservation programs.
W79-01987

3E. Conservation In Industry

ENERGY RESOURCES DEVELOPMENT IN WYOMING'S POWDER RIVER BASIN: AN ASSESSMENT OF POTENTIAL SOCIAL AND ECONOMIC IMPACTS,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W79-01545

GEOTHERMAL POWER AND WATER PRODUCTION STUDIES AT THE UNIVERSITY OF CALIFORNIA,
California Univ., Berkeley. Sea Water Conversion Lab.
A. D. K. Laird, J. R. Darnell, B. W. Tleimat, G. J. Smith, and F. V. Stickel.
American Society of Mechanical Engineers, Winter Annual Meeting, December 10-15, 1978, Paper 78-WA/Ener-7. 9 p, 12 fig, 4 tab, 8 ref. (California Water Resources Center Desalination Project).

Descriptors: *Geothermal studies, *Thermal powerplants, *Thermal power, *Water sources, Water supply.

This paper summarizes results of studies on geothermal dual-purpose power and water production plants using geothermal and other working fluids. Combinations of heat exchanger and direct contact condensers with evaporative, dry and mixed cooling are considered. Effects of system parameters on production are given. Higher temperatures favor the use of open, or water, cycles, particularly when brines are low in dissolved solids, noxious gases and bicarbonates. At lower temperatures, either the water or the binary fluid cycle may be preferrable, depending on conditions. (Snyder-Calif, Davis)
W79-01546

USE IN THE BRICK INDUSTRY OF HIGHLY DISCOLORED FIBERS RECOVERED FROM THE FINAL EFFLUENT CLARIFIER OF A PAPER MILL (VERWERTUNG VON STARK VERFAERBTEM FANGSTOFF AUS DER REST-ABWASSERKLAERANLAGE EINER PAPIER-FABRIK IN DER ZIEGELINDUSTRIE),
VEB Druck- und Spezialpapiere, Golzern (East Germany).
K. Kirsten, and F. Porschmann.
Zellstoff und Papier, Vol. 27, No. 2, p 83-84, March/April, 1978. 4 illus, 2 ref.

Descriptors: *Pulp wastes, *Fibers(Plant), *Bricks, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Color, Brickmaking industry, Waste disposal, Water reuse.

Fibers reclaimed from clarified (sedimented) paper mill effluents may be reused in papermaking. The use of fibers which are too highly discolored for this purpose is discussed, especially as porosity-improving additives in brickmaking. (Ward-IPC)
W79-01607

COMPONENTS OF A SUCCESSFUL IN-MILL CLOSE UP PROGRAM,
Consolidated Papers, Inc., Whiting, WI.
For primary bibliographic entry see Field 5D.
W79-01613

AUSTRIAN NATIONAL REPORT ON NON-WASTE TECHNOLOGY,
R. Kauders, and U. Ousko-Oberhoffer.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 77-104, 1 fig.

Descriptors: *Pulp and paper industry, *Water pollution control, *Austria, Technology, Economics, Resources, Conservation, Water conservation, Heat, Filters, Slime, Water reuse, Recycling, Coals, Quartz, Gravels, Foreign countries, Europe, Sulfur dioxide, Magnesium oxide, Spent sulfide liquor, Boxboard, Waste paper, Chemical recovery, Chemical industry.

This report outlines and gives some technological and economic details for 19 already practiced procedures plus 3 still under development in Austrian chemical industries for resource conservation and environment protection. Among the approved technologies, two are concerned with pulp, paper, and board manufacture, viz., (1) the Lenzing magnesium bisulfite recovery process for recovering MgO, sulfur dioxide, and heat from spent sulfite liquor of 15% solids content; and (2) the production of folding boxboard (250 tons/day) from a furnish comprising up to 85% waste papers, with considerable water conservation (reduction of waste waters from 8,000 to 1,000 cu m/day) and without water pollution, via a process developed by Ruthner Industrieanlagen AG. (Vienna) which involves 4 closed filter boilers (with quartz gravel and hydroanthracite filter media), a reactivator for separating fines, and dosing of recycled process water with bleach liquor to prevent slime problems. (Brown-IPC)
W79-01621

HOW AND WHY WE CHOSE INTEGRAL RECYCLING (AT THE ISOREL FIBERBOARD PLANT, CASTLEJALOUX, FRANCE),
Isorel, Puteaux (France).
B. Marechal.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 231-238. 5 fig.

Descriptors: *Pulp wastes, *Water pollution control, *Hardboard mills, *France, Control systems, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Aerated lagoons, Water reuse, Recycling, Water conservation, Water pollution, Closed systems, Insulation board, Fiberboard mills, Pollution abatement, Suspended solids.

After considerable efforts and disappointing results with the economics of external effluent treatment measures to abate water pollution at a wet-process hardboard and insulation board factory, the Isorel company developed a closed-circuit manufacturing process involving the installation of a buffer tank between the plant and the river, with two stand-by aerated lagoons in case of pipeline breakage, and a luminous process-control panel for monitoring all sensitive points in the water circuits. Adaptation to the high-solids process stream (90-100 g of dry solids/liter) required modifications in the thermo-mechanical pulp refining, stock dewatering, and hot-pressing procedures, as well as many smaller adjustments in equipment operation. Water pollution has been drastically cut from 110 to 0.8 kg/ton of building board produced, equivalent to 99.3% efficient abatement. (Brown-IPC)
W79-01622

NON-WASTE PRODUCTION OF BLEACHED KRAFT PULP,
Toronto Univ. (Ontario).
W. H. Rapson, and D. W. Reeve.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 379-384. 13 ref.

Descriptors: *Pulp and paper industry, *Water pollution control, *Kraft mills, Water pollution sources, Pulp wastes, Bleaching wastes, Industrial wastes, Wastes, Canada, Foreign countries, North America, Pollution abatement, Water reuse, Recy-

cling, Effluents, Barking, Pulping, Pulp washing, Pulp bleaching, Chemical recovery.

Barking, pulping, pulp washing, bleaching, chemical recovery, and effluent-recycling technologies developed with government support in Canada to make the pollution-free kraft mill a practical reality are reviewed. (Brown-IPC)
W79-01624

CHARACTERIZATION AND REUSE OF ASH POND EFFLUENTS IN COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 5C.
W79-01674

RECOVERING SYSTEM FOR CHROME-PLATING WASTEWATER CONTAINING CHROMIC ACID (KUROMU MEKKI HAISUI NO SHORI SHISUTEMU),
For primary bibliographic entry see Field 5D.
W79-01767

STATUS OF THE CLOSED-CYCLE CONCEPT KRAFT MILL AT GREAT LAKES PAPER CO.,
Great Lakes Paper Co., Ltd., Thunder Bay (Ontario).
J. A. Isbister, D. W. Reeve, and W. H. Rapson.
Paper Trade Journal, p 32-36, October, 1978.

Descriptors: *Industrial water, *Waste reuse, *Bleach wastes, *Recycling, *Industrial wastes, *Pulp and paper industry, Pulp wastes, Evaporation, Biochemical oxygen demand, Corrosion, Desalination, Operation and maintenance, Water pollution control, Pilot plants, Chlorine compounds, Waste water treatment.

The 800 tpd bleached kraft pulp mill operated by Great Lakes Paper Co. in Thunder Bay, Ontario, Canada, accommodated the first application of the Rapson-Reeve (closed-cycle) concept. The 'B' mill, which started up in 1976, employs a D/C-C-E-D-E-D bleach sequence, salt recovery, and high chlorine dioxide use (70%) in the first bleaching stage. Water consumption at the bleach plant is minimized to balance with inputs in the form of recovered filtrate. Four spill pits were incorporated into the design of the closed-cycle system; future efforts will be directed toward collecting all spills during shutdowns and upsets for return to processing without overflow. At present, process effluent is still discharged during upsets. Current objectives for the closed-cycle system include reducing defoamer and bleach chemical consumption, preventing corrosion of washer drums and the recovery furnace precipitator, increasing the black liquor Btu value to reduce external fuel makeup requirements, and improving overall coordination of mill operations. Of the 8.3 ton/day total BOD discharged by the mill, the sextuple-effect evaporator condensates and foul condensates contribute the largest quantity not associated with bleaching operations (4.9 tons/day). On the basis of the performance of the 'B' mill, the Ontario Ministry of the Environment has recommended that a similar closed-cycle recovery system be installed in another Great Lakes Paper Co. mill in the Thunder Bay complex. (Schulz-FIRL)
W79-01773

RATIONALIZATION AND ENVIRONMENTAL PROBLEMS OF BEAMHOUSE OPERATIONS,
For primary bibliographic entry see Field 5D.
W79-01778

DEVICE FOR TREATING WASTE WATER,
For primary bibliographic entry see Field 5D.
W79-01877

3F. Conservation In Agriculture

THE EFFECT OF IRRIGATION ON THE SURVIVAL AND DEVELOPMENT OF PARASITIC NEMATODE LARVAE IN WESTERN MONTANA,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 5C.
W79-01540

UPTAKE AND TRANSLOCATION OF A NONIONIC SURFACTANT BY BARLEY,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2I.
W79-01563

NONIONIC SURFACTANT EFFECTS ON GROWTH AND POROSITY OF BARLEY ROOTS,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2I.
W79-01564

INVENTORY OF WETLAND HABITAT USING REMOTE SENSING FOR THE PROPOSED OAHE IRRIGATION UNIT IN EASTERN NORTH DAKOTA
South Dakota State Univ., Brookings. Remote Sensing Inst.
R. G. Best, and D. G. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 Price codes: A03 in paper copy, A01 in microfiche. 1977. 14 p, 8 fig, 5 tab, 3 ref, 2 append.

Descriptors: *Wetlands, *Census, *South Dakota, *Aerial photography, *Wildlife habitats, Marshes, Wildlife management, Mapping, Remote sensing, Freshwater marshes, *Oahe irrigation project(SD), *Type I wetlands, Wildlife mitigation plan.

An inventory of wetland for the area included in the proposed Oahe Irrigation Project was conducted to provide supplemental data for the wildlife mitigation plan. This report, including the data summaries, follows a report which documented the interpretation techniques as presented by Best, Moore, and Brewster for inventorying small, predominatly Type I wetlands in the low-relief terrain of the Lake Dakota Plain. Wetland habitat in over 310,000 acres in the Oahe irrigation district was inventoried. There were 5305 wetlands representing 7530 acres, 589 acres of natural drains, and 1545 acres of stream habitat in the area. The data were stored and tabulated in a computerized spatial data analysis system. The data summaries are provided for various spatial stratification. (Steiner-Mass)
W79-01636

SPRINKLER IRRIGATION PRACTICES AND WATER LOSSES: WATER SHORTAGES UNDERLINE NEED FOR CONSERVATION,
Texas Agricultural Extension Service, College Station.
R. L. Duble.
Irrigation Journal, Vol 27, No 2, p 16-17, 20, 46, March-April, 1977. 3 fig.

Descriptors: *Sprinkler irrigation, *Irrigation practices, Irrigation systems, *Water conservation, Water resources, Turf, Irrigation efficiency.

Having witnessed the effects of a water shortage in many sections of the country during the summer of 1976, the value and need for conservation of water can be appreciated. Since scientists forecast more extensive droughts throughout the next decade, people must become more conscious of water use. In order for there to be adequate water supplies for turf irrigation in the future, careful management of water resources is necessary and must be implemented now. (Skogerboe-Colorado State)
W79-01673

HOW THEY'RE HARNESSING THE SUN TO PUMP WATER,
R. Larsen.
Irrigation Age, Vol 12, No 2, p 6-8, October, 1977. 4 fig.

Descriptors: Irrigation, Irrigation practices, Irrigation systems, Solar radiation, *Pumping, *Energy conversion.

Serious efforts to harness the sun's rays for energy have been few. Now there is a major attempt by private firms and government agencies to find a way of using sunlight to power the nation's irrigational systems. (Skogerboe-Colorado State)
W79-01679

AN INTRODUCTION TO EMISSION UNIFORMITY,
Rain Bird Sprinkler Mfg. Corp., Glenora, CA.
For primary bibliographic entry see Field 8B.
W79-01686

MAINLINE INSTALLATION,
AG Water, Shafter, CA.
F. Hamisch.
Drip/Trickle Irrigation, Vol 2, No 2, p 12 and 30, 1977. 1 fig.

Descriptors: *Irrigation systems, Irrigation practices, Irrigation design, Hydraulics, Pipes, Piping systems, Pipelines, *Drip irrigation.

The mainline is an integral part of the drip irrigation system. In order for the installed pipeline to perform properly, it must be properly designed. The pipeline designated must be of the proper size with appropriate protection devices, such as pressure reliev valves, vacuum relief valves, air release valves and check valves. (Skogerboe-Colorado State)
W79-01689

DRIP IRRIGATION AT SUPERIOR FARMING: WATER USE CUT 30%, FERTILIZER 50% BY THIS LARGE CORPORATE FARM,
R. Mallory.
Irrigation Journal, Vol 27, No 3, p 20-21, May-June, 1977. 5 fig.

Descriptors: Irrigation, *Irrigation practices, Irrigation systems, *Irrigation efficiency, Water conservation, *Drip irrigation.

Superior Farming Company, which first started its drip irrigation experiments in 1971, had its 8,000 acres of trees and vines under drip by 1975--20 percent of the total drip irrigated acreage in California at the time. (Skogerboe-Colorado State)
W79-01690

WORLD'S LARGEST SOLAR-POWERED IRRIGATION SYSTEM OPERATING IN ARIZONA: RISING ENERGY COSTS CAUSE EXPLORATORY VENTURE.
Irrigation Journal, Vol 27, No 4, p 14-15, July-August, 1977.

Descriptors: *Arizona, *Irrigation systems, Irrigation practices, *Solar radiation, *Pumping plants, Energy conversion.

The world's largest solar-powered irrigation system was dedicated in late April at Northwestern Mutual Life Insurance Company's Gila River Ranch, southwest of Phoenix. The system, developed by the Columbus Laboratories of Battelle Memorial Institute, includes a 50-horsepower pump capable of delivering up to 10,000 gallons of irrigation water per minute at peak operation. (Skogerboe-Colorado State)
W79-01692

INFLUENCE OF K ON THE UPTAKE, TRANSLOCATION, AND REDUCTION OF NITRATE BY BARLEY SEEDLINGS,
Kentucky Univ., Lexington. Dept. of Agronomy.
D. G. Blevins, A. J. Hiatt, R. H. Lowe, and J. E. Leggett.
Agronomy Journal, Vol. 70, No. 3, p 393-396, May-June, 1978. 5 fig, 1 tab, 17 ref.

Descriptors: *Nitrates, Translocation, Reduction(Chemical), *Barley, *Organic acids, Metabolism, Calcium, *Potassium, Growth chambers, *Hydrogen ion concentration.

The absorption, translocation, and metabolism of N is influenced by the source of N and was influenced by the source of N and by the availability and mobility of counter ions for transport. The purpose of this study was to determine the influence of K or Ca on nitrate uptake, translocation, and reduction in barley seedlings. Six-day-old barley seedlings were grown for 2 to 36 hours in solutions of 1.0 meq/liter KNO3 or Ca(NO3)2, each containing 0.4 meq/liter of CaSO4. Experiments were conducted in a growth chamber at 27C with a photosynthetic irradiance of 5.3 mW times cm-3. Seedlings treated with Ca(NO3)2 (low K) had lower levels of nitrate uptake, nitrate reductase activity, and lower organic acid concentrations than seedlings treated with 1 mM KNO3. The solution pH and the expressed sap pH of roots and shoots of the low K seedlings increased during the experiment. The shoots of the low-K seedlings had much lower nitrate concentrations and lower levels of nitrate reductase activity than the roots, suggesting that K plays a major role in nitrate translocation. These results support the hypothesis that potassium malate is cycled from the tops to the roots where decarboxylation occurs, providing a source of HCO3(-) for exchange with NO3(-) during absorption. (Skogerboe-Colorado State)
W79-01693

EVALUATION OF PEAT AND GRANULAR INOCULUM FOR SOYBEAN YIELD AND N FIXATION UNDER IRRIGATION,
Washington State Univ., Pullman. Coll. of Agriculture Research Center.
D. F. Bezdicek, D. W. Evans, B. Abede, and R. E. Witters.
Agronomy Journal, Vol. 70, No. 5, p 865-868, September-October, 1978. 1 fig, 5 tab, 15 ref.

Descriptors: *Nitrogen fixation, *Soybeans, *Peats, Granules, Symbiosis, *Crop production.

The purpose was to evaluate peat and granular inoculum for effectiveness in nodulation, N fixation, and yield of soybeans in a soil deficient in N. Maximum yield response from inoculation (less control) was 3,454 kg/ha (51.4 bu/A) in 1975 and 2,547 kg/ha (37.9 bu/A) in 1976. Total N fixed was estimated to be as high as 311 and 263 kg/ha in 1975 and 1976, respectively. The proportion of plant N derived from N fixation ranged from 71 to 80 percent. Estimates of total N fixed based on acetylene reduction were half of those based on total plant N. In general, higher soybean yield and better nodulation were obtained with the granular than peat carriers, although in these instances, higher-than-recommended rates of granular carriers were used. These studies show that soybeans are capable of fixing over 300 kg/ha of N, an amount which is considerably higher than that reported elsewhere. The data suggest that in soybean-growing areas where 25 to 40 percent of the total N is from fixation, the soybean symbiotic N-fixing system is capable of fixing sufficient N for yields far beyond that now reported. (Skogerboe-Colorado State)
W79-01702

NUTRIENT UPTAKE BY GRASS AND LEACHING LOSSES FROM SOLUBLE AND S-COATED UREA AND KCL,
National Fertilizer Development Center, Muscle Shoals, AL.
S. E. Allen, G. L. Terman, and H. G. Kennedy.
Agronomy Journal, Vol 70, No 2, p 264-268, March-April, 1978. 4 fig, 4 tab, 6 ref.

Descriptors: *Leaching, Fescues, Sudangrass, Nutrients, *Fertilizers, Nitrogen, *Potassium chloride, Crop response, Lysimeters, *Ureas, *Absorption, Chlorides, *Grasses.

Slow-release fertilizers should provide for more efficient nutrient use by the crop as well as reduce leaching losses. This study was conducted to measure crop response to N or K in uncoated urea, ammonium nitrate, S-coated urea, and S-coated KCl and to relate leaching losses to NO3 - N and cations. In one series, granular N sources to supply 200 or 400 kg of N/surface ha were mixed with the upper 20 cm of a 1:1 mixture of Norfolk sl (Typic Paleudult) and builders sand contained in 15 cm by 120 cm columns. A second series was similarly fertilized with K sources to supply 100 or 200 kg of K/surface ha. (Skogerboe-Colorado State)
W79-01705

IRRIGATION EFFECTS ON VEGETATIVE AND REPRODUCTIVE DEVELOPMENT OF THREE SOYBEAN CULTIVARS,
Georgia Univ., Athens. Dept. of Agronomy.
D. A. Ashley, and W. J. Ethridge.
Soil Science Society of America Journal, Vol. 42, No. 3, p 467-471, May-June, 1978. 6 tab, 13 ref.

Descriptors: *Soybeans, *Supplemental irrigation, Growth stages, *Plant growth, *Irrigation effects.

This field experiment considered four moisture regimes-no irrigation, full season irrigation, irrigation starting at bloom stage, and irrigation starting at pod fill stage-on three soybean cultivars, 'Ransom', 'Hamptom 266A' and 'Coker 102'. Data were collected for seed yield, pod number and dry weight, dry weight of vegetative components during reproductive developmet and seasonal soil moisture status. The soil was a sandy loam. Full season and bloom stage irrigation treatments produced higher yields than the unirrigated check except for Hamptom 266A in 1974. Yields from plants receiving the podfill stage irrigation treatment were higher than the unirrigated check in drier seasons of 1972 and 1973 but not in 1974. Irrigation beginning at pod fill produced yields equal to the full season and bloom stage treatments in some cases and somewhat lower yields in other cases. Water application prior to blooming greatly increased vegetative dry weight, number, and dry weight of pods. Beginning irrigation during reproductive development had litle effect on vegetative dry weight, but usually resulted in a greated number of pods late in the season than the unirrigated check. Higher yields and greater response to irrigation were obtained from shorter Ransom plants than the other two cultivars. (Skogerboe-Colorado State)
W79-01708

CROP WATER REQUIREMENT IN RELATION TO CLIMATE AND SOIL,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W79-01712

SIMULATION OF NITROGEN PROCESSES IN SOILS FOR ESTIMATING FERTILIZER REQUIREMENTS,
Technion - Israel Inst. of Tech., Haifa. Faculty of Agricultural Engineering.
For primary bibliographic entry see Field 2K.
W79-01713

ALFALFA WATER USE AND PRODUCTION ON DRYLAND AND IRRIGATED SANDY LOAM,
North Dakota State Univ., Fargo. Dept. of Soils.
J. W. Bauder, A. Bauer, J. M. Ramirez, and D. K. Cassel.
Agronomy Journal, Vol 70, No. 1, p 95-99, January-February, 1978. 2 fig, 3 tab, 12 ref.

Descriptors: *Alfalfa, *Irrigation effects, Soil-water-plant relationships, Moisture stress, Evapotranspiration, *Fertilization, *Crop production, Great Plains, Correlation analysis, *Loam, Sands.

This study was carried out on a Maddock sandy loam soil, a member of the sandy, mixed frigid Udorthentic Haploboralls. Four irrigation levels, ranging from dryland to excessive irrigation, were established as whole plots in a randomized block, split plot design. Eight different fertilizer treatment of P, K, and S were applied to split plots during the 1st year of the study. Under a three harvest per season management system dry matter yield was significantly affected by harvest number and irrigation treatment each year. Within the dryland and deficient irrigation treatment by year, yields decreased with each cutting; with optimum and excessive irrigation, yields varied inconsistently with cutting; yields increased 14 to 330 percent over dryland by increasing irrigation applications. When plant water stress existed throughout the growing season, relative yield correlated with relative evapotranspiration in a near perfect, linear manner. Under nonstress conditions, irrigation, growing season precipitation, and soil water depletion required consideration to attain nearly perfect correlation of relative yield with relative evapotranspiration. The results of this study indicated that under plant water stress conditions, alfalfa dry matter yield is a linear function of plant water use. (Skogerboe-Colorado State)
W79-01715

EFFECT OF SOIL MATRIC POTENTIAL AND SEEDING DEPTH ON EMERGENCE OF BARLEY,
Pahlavi Univ., Shiraz (Iran). Dept. of Irrigation.
A. R. Sepaskhah, and E. R. Ardekani.
Agronomy Journal, Vol. 70, No. 5, p 728-731, September-October, 1978. 4 tab, 17 ref.

Descriptors: *Barley, Germination, Emerging vegetation stage, *Seeds, Moisture tension, Crop production, Crop response, *Soil matrix potential.

The effect of soil matric potential and seeding depth on emergence percent and rate of emergence of barley were investigated. Seedling emergence of 'Zarjo' cultivar of barley was measured in a Calcixerollic Xerochrept soil at -0.6 to -30.0 bars soil matric potentials and at 2 to 12 cm seedling depths in the greenhouse. Cultivar response to seedling depth was determined by seedling emergence measurements of 'Torsh', Zarjo, and 'Shaneii' cultivars at seeding depths of 2 to 12 cm under the same experimental conditions. Soil matric potential of -30.0 bars reduced the seedling emergence of Zarjo and resulted in the lowest emergence rate. However, soil matric potentials of -0.6 and -1.5 bars also reduced Zarjo emergence at the 12-cm seeding depth. Seedling emergence and emergence rate of Zarjo were lower at the 12 cm seeding depth at all levels of soil matric potentials. The emergence rate was also reduced at the 8-cm seeding depth, but only at -30.0 bars. Seedling emergence of Shaneii was found to be lower than that of the Torsh and Zarjo cultivars. The rates of emergence of the cultivars were not greatly different at the various seeding depths. (Skogerboe-Colorado State)
W79-01718

A METHOD OF PROMOTING PENETRATION OF WATER INTO TIGHT, SLOPING SOIL UNDER DRIP IRRIGATION,
Massachusetts Univ., Amherst. Dept. of Plant and Soil Sciences.
D. Hillel.
Soil Science, Vol 125, No 5, p 329-330, May, 1978. 1 fig.

Descriptors: *Irrigation, *Infiltration, *Penetration, Runoff, Evaporation, Root zone, Gravels, *Methodology, Drip irrigation.*

A method is proposed to increase penetration of *water into the root zone, as well as to reduce* runoff and evaporation by means of gravel-filled pits under each emitter when drip irrigation is *applied to sloping ground of low infiltrability.* A sample calculation is provided to help determine the optimal dimensions of the gravel pits. (Skogerboe-Colorado State)
W79-01719

IRRIGATION TIMING-ITS INFLUENCE ON THE EFFECTS OF SALINITY AND WATER-LOGGING STRESSES IN TOBACCO PLANTS,
Victoria Dept. of Agriculture, Tatura (Australia). Horticulture Research Station.
D. W. West, and J. D. F. Black.

Soil Science, Vol. 125, No. 6, p 367-376, June, 1978. 1 fig, 4 tab, 33 ref.

Descriptors: Saline water, Water quality, Sodium chloride, Drainage, Soil-water-plant relationships, Oxygen, *Irrigation, Diffusion, Growth chambers, *Tobacco, *Salinity, *Waterlogging.

The effects of irrigation timing on the interaction between salinity and waterlogging, and changes in the oxygen status in the root zone of a heavy soil under tobacco plants irrigated with drip system were studied. Water uptake was significantly reduced by the presence of NaCl in the root zone irrespective of irrigation and drainage treatment. Leaf chloride in all nonsalinized treatments was significantly lower than in all salinized treatments. Both day and night waterlogged saline treatments contained significantly higher leaf chloride than the nonwaterlogged saline treatment. The night-waterlogged saline treatment contained significantly lower leaf chloride than the day-waterlogged saline treatment. Similar trend to higher CL(-) content with day waterlogging was present with petioles and stems. Root CL(-) concentrations were relatively low irrespective of treatment. Leaf sodium concentrations were relatively low irrespctive of treatment. Leaf sodium concentrations of day- and night-waterlogged saline treatments were significantly higher than all other treatments, and the day-waterlogged salinized plants had significantly higher leaf Nat than the night-waterlogged salinized plants. The results suggests that plants in a soil with some chance of being waterlogged in the root zone and with NaCl present in the root zone would benefit from being irrigated at night rather than during the day. (Skogerboe-Colorado State)
W79-01720

THE TIMELINESS BENEFIT OF SUBSURFACE DRAINAGE,
Soil Conservation Service, Kankakee, IL.
L. W. Wendte, C. J. W. Drablos, and W. D. Lembke.
Transactions of the American Society of Agricultural Engineering, Vol 21, No 3, p 484-488, May-June 1978. 6 fig, 3 tab, 21 ref. OWRT A-077-ILL(2).

Descriptors: *Subsurface drainage, *Agriculture, *Benefits, *Model studies, Mathematical models, Planting management, Drainage, Spring, Soils, Soil water, Economics, Time, Farm management, Drains, Subsurface drains, Tile drains.

A simulation model was developed to predict available spring workdays and the earliest possible planting dates for soils with a subsurface drainage system. Applying the model to two Illinois soils, it was found that as many as two available workdays in April and 19 days in May are gained by installing a recommended subsurface drainage system. The optimum drain spacing based on the timeliness benefit of earlier corn planting ranged from 24 to 61 m, depending on permeability and soil type. The average annual timeliness benefit for installing the optimum subsurface drainage system was $37 to $156/ha. (Sims-ISWS)
W79-01728

ROOT-SINK DESCRIPTIONS OF WATER SUPPLY TO DRYLAND WHEAT,
Agriculture Research Service, Pendleton, OR. Columbia Palteau Conservation Research Center.
R. W. Rickman, R. R. Allmaras, and R. E. Ramig.
Agronomy Journal, Vol. 70, No. 5, p 723-728, September-October, 1978. 11 fig, 13 ref.

Descriptors: Moisture uptake, *Wheat, *Moisture tension, *Soil water movement, Soil profiles, *Root distribution, Dry farming, Soil-water-plant relationships, Sink, Hydraulic conductivity, *Soil water potential.

Soil water content changes were supplemented with calculations of water flow between soil layers to provide an improved description of water uptake by dryland wheat (Triticum aestivum L.). Water content changes were estimated from neutron meter measurements. Soil water flux was estimated from field measurements of both hydraulic conductivity and hydraulic head gradients; unsaturated conductivity beyond the range of field measurement was calculated with the pore interaction model of Marshall matched to field measured values at 250 mb. Seasonal water-uptake patterns, determined by the root-sink description, differed from those shown by only water content measurements. Peak water-use rates did not coincide with maximum leaf area index, but coincided with the period from heading to completed head extension. Water flux in the profile was important for supplying water during grain filling and was critical in this layered soil, which restricted rooting to depths less than 150 cm. (Skogerboe-Colorado State)
W79-01732

DIFFERENCES AMONG GENOTYPES OF CORN IN THE KINETICS OF P UPTAKE,
Royal Veterinary and Agricultural Coll., Copenhagen (Denmark).
N. E. Nielsen, and S. A. Barber.
Agronomy Journal, Vol. 70, No. 5, p 695-698, September-October, 1978. 6 tab, 23 ref.

Descriptors: *Corn(Field), *Phosphorus, Simulation analysis, Soil properties, *Root systems, Correlation analysis, *Absorption, *Kinetics.

Many plant species utilize fertilizer or soil P inefficiently. A survey of 12 inbred corn genotypes (Zea mays L.) grown in water culture indicated a 1.8 to 3.3-fold variation in root weight, root length per unit of plant weight, root length per unit of root weight, and maximal net P influx. Some aspects of the role of genetics were elucidated by comparing the P absorption parameters of five inbreds with those of four single-cross hybrids made from these inbreds. Five single crosses were grown at low and high P levels in the field on a Raub silt loam (Aquic Argiudoll) to test the significance of the measured root parameters on P uptake. Plants were harvested 22, 38 and 51 days after planting. Phosphorus uptake was also simulated by a model using soil and plant root parameters related to P uptake. The correlation between predicted and observed P uptake was r2 = 0.90 for the 22 to 38-day time interval and r2 = 0.98 for the 22 to 51-day time interval. Hence, observed differences among corn single crosses in their plant root parameters were reflected in their P uptake when grown in the field. (Skogerboe-Colorado State)
W79-01733

CORN AND ALFALFA PRODUCTION AS INFLUENCED BY IRRIGATION AND SALINITY,
Utah State Univ., Logan.
For primary bibliographic entry see Field 3C.
W79-01734

EFFECT OF SLOW RELEASE FERTILIZER ON FERTILIZER RESIDUES AND ON YIELD AND COMPOSITION OF FLUE-CURED TOBACCO,
Philippines Univ., College. Coll. of Agriculture.
G. O. San Valentin, W. K. Robertson, J. T. Johnson, and W. W. Weeks.
Agronomy Journal, Vol. 70, No. 2, p 345-348, March-April, 1978. 9 tab, 7 ref.

Descriptors: *Tobacco, Potassium, *Fertilizers, Solubility, Nutrient removal, Sulfur, *Crop production, Sands, Soils.

Tobacco was grown for 5 years on Lakeland fine sandy soil, a soil which retains very little K. Split applications of K2SO4 were compared to single applications of K2SO4 and resin- polyvinyl-, and S-coated K materials. Yields and chemical composition of tobacco leaves and soil were used to measure the relative effectiveness of K treatments. Yields and K contents of tobacco leaves were increased by K fertilization. Split applications of K2SO4 were more effective than single applications at planting. In years with heavy rainfall, applying slowly-soluble sources all at planting was better than applying K2SO4 in split application. Potassium from slowly soluble materials was less readily leached than from K2SO4, resulting in higher concentration of K within 60 cm of the surface at the time of tobacco flowering. When various thickness of S were applied to give a range of K release, the thicker coatings gave higher yields. Treatments that provided higher K contents increased total alkaloids and decreased reducing sugars in the first of the two years that they were measured. Application of K fertilizers with reduced solubility should assure good yields, quality, and a high level of K in tobacco. (Skogerboe-Colorado State)
W79-01736

WATER SUPPLIES AND COSTS IN RELATION TO FARM RESOURCE DECISIONS AND PROFITS ON SACRAMENTO VALLEY FARMS,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W79-01737

PROFILE MODIFICATION OF A FRAGIUDALF TO INCREASE CROP PRODUCTION,
Missouri Agricultural Experiment Station, Columbia.
J. M. Bradford, and R. W. Blanchar.
Soil Science Society of America Journal, Vol. 41, No. 1, p 127-131, January-February 1977. 5 fig, 4 tab, 9 ref. OWRT A-068-MO(4), 14-31-0001-4025 and 5025.

Descriptors: Root penetration, *Soil water, Water availability, Sawdust, Subsoiling, Liming, *Crop production, *Root systems, Soil profiles.

Root development and crop yields are greatly reduced in soils having fragipan layers because of restricted air and water movement, high bulk densities and soil strength, and high acidity. In the first year after soil profile modification by trenching of a Missouri Typic Fragiudalf, available water storage and yields of grain sorghum (Sorghum bicolor (L.) Moench) were increased. Within unmodified areas, sorghum yields averaged 1,841 kg/ha. Deep trenching without chemical or physical additives increased yields to 4,322 kg/ha. Mixing lime, fertilizer, and sawdust with the soil material within the trenches increased grain sorghum yields to 5,987 kg/ha. The sawdust significantly increased water storage and water extraction, resulting in the grain yield increase. Reexcavation of a pit used by the Soil Conservation Service for soil series identification of the Hobson soil showed no signs of soil density or strength reformation during the 16-year period since the pit was refilled.
W79-01740

EFFECT OF FERTILIZATION ON PENNCROSS CREEPING BENTGRASS,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
D. V. Waddington, T. R. Turner, J. M. Duich, and E. L. Moberg.
Agronomy Journal, Vol 70, No. 5 p 713-718, 1978. 2 fig 7 tab 15 ref.

Descriptors: *Fertilization, *Turf grasses, Fertility, Productivity, *Nitrogen, *Phosphorus, *Potassium, Soil tests, *Bent grass.

A field study was conducted on fine, mixed soil to determine the effects of N sources (Agrinite, Milorganite, ureaform, and urea), P rates (0, 0.49, 0.98, and 1.95 kg/100 m2), and K rates (0, 0.76, and 1.52 kg/100 m2) on soil nutrient levels and the growth, quality, and chemical compostion of 'Penncross' creeping bentgrass (Agrostis palustris Huds.) maintained as putting green turf. Wilting, disease, chlorosis, and annual bluegrass (Poa annua L.) infestation were used to assess quality. Fertilization with Milorganite increased available soil P and Mg. Application of K increased both tissue and available soil K. However, a greater increase in soil K and a smaller increase in tissue K were obtained by the second additional increment of K than the first one. The greatest change in tissue P occurred with the first incremental addition of one.

The greatest change in tissue P was not greatly affected by soil P above 24 ppm. Less severe summer wilting was observed with Agrinite, Milorganite, and K treatments. Annual bluegrass invasion was favored by P and K fertilization and the effect of one was enhanced by the other. Milorganite, which increased soil P, also favored annual bluegrass. (Skogerboe-Colorado State)
W79-01754

EFFECTS OF CULTURAL PRACTICES ON GRAIN YIELD OF IRRIGATED WHEAT,
Arizona Univ., Tucson. Dept. of Plant Sciences.
A. D. Day, E. B. Jackson, and A. Alemu.
Agronomy Journal, Vol. 70, No. 2, p 279-282, March-April, 1978. 4 tab, 21 ref.

Descriptors: *Wheat, Cultural control, *Nitrogen, *Fertilization, Crop production, Planting management, Beds, Irrigation, Arizona.

Experiments were conducted at Yuma, Arizona to study the effects of N fertilizer treatment in combination with methods of planting and row positions on beds, on the yield and quality of wheat grain. Six N fertilizer treatments (34, 17 + 17, 68, 34 + 34, 136, and 68 + 68 kg/ha), two methods of planting (on the flat and on beds), and four row positions on beds (north, south, east, and west) were evaluated. Flat plantings resulted in higher wheat grain yields than did bed plantings; however, bed plantings produced higher grain volume-weights. Within planting methods, N fertilizer treatments did not significantly influence grain yields or grain volume-weights. Grain yield components were similar for both planting methods. Wheat grown on beds with an east-west orientation produced more heads per unit area, more seeds per head, and higher grain yields than did wheat produced on beds oriented in a north-south direction. Wheat responded to N fertilization when grown on both flat and bed plantings during the winter months in the Southwest. (Skogerboe-Colorado State)
W79-01761

A METHODOLOGY FOR TESTING THE ACCURACY OF YIELD PREDICTIONS FROM WEATHER-YIELD REGRESSION MODELS FOR CORN,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
W. L. Nelson, and R. F. Dale.
Agronomy Journal, Vol. 70, No. 5, p 734-740, September-October, 1978. 5 tab, 21 ref.

Descriptors: Statistical models, Technology, Weather data, *Regression analysis, *Corn(Field), *Nitrogen, *Indiana, *Crop production, *Model studies.

Analysis of variance (ANOVA) techniques were used to evaluate the accuracy of yield predictions for corn in Indiana counties with four statistical models: (1) Thompson approach, (2) modified Thompson approach, with a nitrogen technology term, (3) a 1974 model by Leeper, Runge, and Walker and (4) a 1975 model by Dale and Hodges. For models (1), (2), and (4), separate versions were developed with the particular series of weather and corn yield data for each county. All models were used to predict yearly average corn yields for a county with data not used to fit the regression coefficients. A significant difference among models was detected by the ANOVA. Multiple comparison tests indicated that regression models (2), (3), and (4) were more accurate than model (1). This result was attributed mainly to the handling of technology or the weather-technology interaction effects on corn yields. The trend variables used in model (1) acted to confound weather and technology effects and create unstable regression models. Although the direct application of the results of this study is limited to Indiana, the methodology for testing the accuracy of yield prodictions is believed to have universal application. (Skogerboe-Colorado State)
W79-01766

MANAGEMENT OF IRRIGATED SOYBEANS ON A MODERATELY COARSE-TEXTURED SOIL IN THE UPPER MIDWEST,
North Carolina State Univ. at Charlotte. Dept. of Soil Science.
D. K. Cassel, A. Bauer, and D. A. Whited.
Agronomy Journal, Vol. 70, No. 1, p 100-104, January-February, 1978. 2 fig, 4 tab, 22 ref.

Descriptors: *Soybeans, Supplemental irrigation, Water management(Applied), Fertilization, Nitrogen, *Nitrates, Tensiometers, *Leaching, *Irrigation programs, *Crop production.

The objectives were to determine the yield potential of supplementally irrigated soybeans on moderately coarse-textured soils and to develop an irrigation schedule for efficient water management. The study, conducted on Maddock sandy loam from 1972 to 1974, employed a split-split plot design with water level as the main block and N fertility rates (0, 56, 112, and 224 kg/ha) as sub-plots. Water levels were W1 (dryland), W2 (under-irrigation), W3 (optimum) and W4 (over-irrigation). Sub-sub plots were planting dates in 1972 and cultivars in 1973 and 1974. Grain yields were significantly different for water levels during each of the 3 years. Three-year yield means were 543, 1,823, 2,428, and 2,164 kg/ha for W1, W2, W3, and W4, respectively. The application of 224 kg/ha N fertilizer in 1972 increased grain yield at the 0.95 probability level. An irrigation scheduling based upon tensiometers proved effective in applying irrigation water. Based upon results of this study, it was concluded that soybeans can be seriously considered as a crop to be included in cropping systems for irrigated, moderately coarse-textured soils in the Upper Midwest. (Skogerboe-Colorado State)
W79-01775

EFFECTS OF CORN STOVER, MANURE, AND NITROGEN ON SOIL PROPERTIES AND CROP YIELD,
Guelph Univ. (Ontario). Dept. of Land Resource Sciences.
J. W. Ketcheson, and E. G. Beauchamp.
Agronomy Journal, Vol. 70, No. 5, p 792-797, September-October, 1978. 4 fig, 8 tab, 6 ref.

Descriptors: *Nitrogen, *Fertilizers, *Corn(Field), *Organic matter, Farm wastes, Soil properties, Crop response, Soil treatment, *Crop production.

Residues and farmyard manures are considered important in determining the N fertilizer requirement of crops. This relationship was studied in a 10-year field experiment on a Typic Hapludalf soil (pH 7.8). Five levels of fertilizer N were applied annually with three management treatments which included (1) returning the stover produced by the preceding corn (Zea mays L.) crop, (2) poultry manure equivalent to 112 kg N/ha/year and (3) no stover returned or manure applied. Dry matter yields and N in grain and stover were measured each year. In general, the manure treatment without N fertilizer gave yields comparable with any other treatment. Where fertilizer N was applied, stover resulted in slightly higher yields than where stover was removed. Stover returned to the soil did not increase fertilizer N requirements at normal rates of application. It was concluded that corn stover residue did not affect the N fertilizer requirement of this soil for grain corn production. Annual applications of liquid poultry manure, containing N equivalent to 112 kg/ha, precluded a requirement for fertilizer N. (Skogerboe-Colorado State)
W79-01781

FERTILIZER PLACEMENT EFFECTS ON SOYBEAN SEED YIELD, N2 FIXATION, AND 33P UPTAKE,
IMinnesota Univ., St. Paul. Dept. of Soil Science.
G. E. Ham, and A. C. Caldwell.
Agronomy Journal, Vol. 70, No. 5, p 779-783, September-October, 1978. 2 fig, 4 tab, 20 ref.

Descriptors: *Nitrogen fixation, *Soybeans, *Phosphorus, Radioisotopes, *Fertilizers, Ureas, Seeds, Productivity, *Crop production, *Absorption.

This study was planned to evaluate the efficiency of P fertilizer utilization by field-grown soybeans with different fertilizer placements using 33P labelled fertilizer (35 kg P/ha) on a Waukegan silt loam soil (Typic Hapludoll) low in plant available N and P. In addition, urea (30 kg N/ha) labelled with 15N was added to measure the effect of P fertilizer placement on N uptake and N2 fixation using the 'A' vaue concept concerning the measurements of available soil nutrients developed by Fried and Dean (1952). Soybean seed yield and total P uptake were increased significantly by adding P fertilizer with no differences among the fertilizer placements (seed yield ranged from 3,811 to 4,035 kg/ha compared to 3,200 kg/ha for the control). The 33P labelled fertilizer provided a direct, quantitative measure of the efficiency of plant use of the added P and provided a basis of evaluating the fertilizer placements without the hazards associated with 33P over the 149-day experiment. The 'A' value concept provided a reliable estimate of N2 fixation which agreed with Kjeldahl measurements. (Skogerboe-Colorado State)
W79-01782

ANALYSIS OF FALLOW-FARMING SYSTEMS IN SEMI-ARID AFRICA USING A MODEL TO SIMULATE THE HYDROLOGIC BUDGET,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 2D.
W79-01785

RELATIONSHIP BETWEEN SOIL TEST AND SMALL GRAIN RESPONSE TO P FERTILIZATION IN FIELD EXPERIMENTS,
South Dakota State Univ., Brookings. Dept. of Plant Science.
P. E. Fixen, and P. L. Carson.
Agronomy Journal, Vol. 70, No 5, p 838-844, September-October, 1978. 3 fig, 8 tab, 35 ref.

Descriptors: *Soil tests, *Fertilization, *Phosphorus, *Grains(Crops), Correlation analysis, Regression analysis, Climatic data, Soil properties, Crop response, Organic matter.

Yield data from 74 small grain field experiments over a 13-year period were used to evaluate the relationship between various soil tests and P response. The soil tests examined in this study were the Bray 1 (soil to solution ratio of 1:7, 1:10, 1:20, and 1:50), Olsen P, and P sorption index of Bache and Williams. The crop species included were Triticum aestivum L., Hordeum vulgare L., and Avena sativa L. The highest correlation between soil test value and yield response to P fertilization was found with the Bray 1, 1:50 ($r2 = 0.41$). An additional 23 percent of the yield response variation could be explained by including six additional variables in a multiple regression analysis employing dummy variables. The r value between P sorption index and yield response on alkaline dummy variables. The r value between P sorption index and yield response on alkaline soils was -0.70 but was near zero for acid soils. Differences were also noted in degree of response between parent materials and crop species. Organic matter content appeared to influence response on some soils. (Skogerboe-Colorado State)
W79-01786

DIFFERENTIAL RESPONSE OF SOYBEAN VARIETIES TO SOIL CADMIUM,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
S. F. Boggess, S. Willavize, and D. E. Koeppe.
Agronomy Journal, Vol. 70, No. 5, p 756-760, September-October, 1978. 1 fig, 5 tab, 30 ref.

Descriptors: *Cadmium, Toxicity, *Soybean, Varieties, *Crop response, Sewage sludge, Soil amendments, Trace elements.

The results are presented of a comprehensive survey of the Cd uptake and effect by a number of the prominent soybean (Glycine Max (L.) Merrill) varieties grown on several CdC12 or sewage sludge-amended soils in the glasshouse. In all varieties, Cd toxicity symptoms appeared as a continuum form slight effects observed as a red, redbrown, or puple coloration at the junction of the leaf blade and tetiole, to severe leaf curling and extensive reddening of the leaf veins, chlorosis, and finally a brittle condition followed by abscission of the leaves. All varieties showed increased shoot Cd concentration and decreased dry weight in response to soil CdC12, but varietal differences in the severity of these Cd effects were observed. Further analysis of data for Cd susceptibility suggested that, of the soybean varieties tested on CdC12-ammended soils, Dunfield, Harosoy, Arksoy, Dare, Flambeau, and Scioto were generally the most susceptible while Clark, Mandarin, Munkden, Jackson, and Lee were consistently ranked as less susceptible (Skogerboe-Colorado State).
W79-01826

INCENTIVES FOR IMPROVED WATER-USE EFFICIENCY: IMPLEMENTATION PHASE,
Abt Associates Inc., Cambridge, MA.
L. C. Kerpelman, B. L. Gettleman, and B. E. Rovin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 524, Price codes: A08 in paper copy, A01 in microfiche. Submitted to Idaho Department of Water Resources, August 1976, 162 p, 39 tab.

Descriptors: *Water resources, *Water conservation, *Water use, *Water management(Applied), *Irrigation, Methodology, Testing procedures, Conservation, Gross income, Farm practices, Water allocation(Policy), *Idaho, *Incentives, Pacific Northwest, Survey data.

This report identifies and measures the relative effects of the legal, institutional, social, and economic factors affecting water conservation and management. These effects are measured in hopes of describing and structuring an incentive program to reduce water use. The most important factor in the state of Idaho concerning water conservation is the management practices and attitudes of farm operators. The report develops measures to assess farm operators' attitudes, water and farm management practices, and reactions to possible water-conservation incentives. The primary data-gathering methods were the Farm Operator Survey, Water-Use Efficiency Ratings, and a Water Organization Survey. The farmers' characteristics discussed in relation to their water conservation attitudes were age, region in which farming took place, income, type of on-farm irrigation system, and water delivery instrumentality. The report presents recommendations concerning which target groups of farmers should be concentrated upon, the structure of incentive programs, how to appeal to the target groups, the medium through which incentive programs are presented to farm operators and the role of water organizations. This report provides a planning basis for the Idaho Department of Water Resources to meet the water resource needs of Idaho citizens. (Coan-NC)
W79-01836

NITROGEN RELEASE CHARACTERISTICS OF ISOBUTYLIDENE DIUREA AND ITS EFFECTIVENESS AS A SOURCE OF N FOR FLUE-CURED TOBACCO,
North Carolina State Univ. at. Raleigh. Dept. of Soil Science.
G. S. Miner, J. P. Lilly, and D. L. Terry.
Agronomy Journal, Vol. 70, No. 3, p 434-438, May-June, 1978. 3 fig, 3 tab, 12 ref.

Descriptors: *Nitrogen, Leaching, *Tobacco, Nutrient remova, Fertilizers, Particle size, *Ureas.

The objectives of this study were to investigate the release characteristics of isobutylidene diurea (IBDU), with N-release characteristics dependent primarily upon the effects of particle size on chemical dissolution rather than the effects of environmental variations on biological activity, in laboratory and greenhouse studies and to evaluate it as a source of N for flue-cured tobacco in the field. Urea, NaNO3, and four particle sizes of IBDU (1.05, 0.75, 0.55, and 0.40 mm) were applied at rates of 200 and 400 mg M per kg of soil to a Norfolk sandy loam (Typic paleudult) in lysimeters and subjected to leaching at 10 invervals over a 109-day period. Percentage removal of N from these sources were observed at different leaching time. The effects of particle size of IBDU on dry matter and N uptake were studied to determine their N release characteristics. IBDU particle sizes of 1.05 and 0.40 mm were compared with NaNO3 and Urea as N sources for flue-cured tobacco. (Skogerboe-Colorado State)
W79-01841

EVALUATION OF NITRAPYRIN AS A MEANS OF IMPROVING N EFFICIENCY IN IRRIGATED SANDS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. L. Hendrickson, D. R. Keeney, L. M. Walsh, and E. A. Liegel.
Agronomy Journal, Vol. 70, No. 5, p 699-703, September-October, 1978. 3 fig, 5 tab, 24 ref.

Descriptors: *Nitrification, Inhibitors, *Nitrogen, Ammonia, Nitrates, Fertilizers, *Potatoes, *Leaching, Osmotic pressure, *Nitrapyrin.

The objective of this research was to determine if optimum levels of N might be maintained throughout the growing season by delaying nitrification with a nitrification inhibitor, Nitrapyrin. Several field experiments were conducted on a Plainfield loamy sand involving various N sources, rates, and times of application with and without Nitrapyrin. Potato tuber yield and the forms and distribution of N in and below the fertilizer bands were determined. Nitrapyrin extended the persistence of applied NH4 in all experiments, but inhibition of nitrification was of relatively short duration. Nitrapyrin persistence was likely reduced by the more rapid volatilization and hydrolysis in sandy soils. Further, the effectiveness of Nitrapyrin was likely limited by rapid leaching NH4 out of the Nitrapyrin-treated zone. Application of Nitrapyrin reduced both total tuber yield and the proportion of marketable tubers. The soil sampling data showed that Nitrapyrin maintained a much higher NH4-N/NO3-N ratio than comparable nonnitrapyrin treatments. It appears that the predominance of NH4-N interfered with plant metabolism so that both yield and normal development of tubers were impaired. (Skogerboe-Colorado State)
W79-01847

EFFECTIVENESS OF NITRAPYRIN IN CONTROLLING NITRIFICATION OF FALL AND SPRING-APPLIED ANHYDROUS AMMONIA,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. L. Hendrickson, L. M. Walsh, and D. R. Keeney.
Agronomy Journal, Vol. 70, No. 5, p 704-708, September-October, 1978. 4 tab, 18 ref.

Descriptors: *Nitrification, Inhibitors, *Denitrification, *Nitrogen, Ammonia, Fertilizers, Crop response, *Corn(Field), Nitrapyrin.

Fertilizer N applied in the fall for the next growing season is often less efficient than N applied closer to the time of plant use. Efficiency might be greatly improved by maintaining the N as NH4, through the use of nitrification inhibitor, Nitrapyrin (2-chloro-6 (trichloromethyl) pyridine). To evaluate this hypothesis, field trials were established during 1975 to 1977 in south central Wisconsin using 84 to 168 kg/ha N applied as anhydrous ammonia with and without 0.55 kg/ha Nitrapyrin. The results indicated that while nitrification can be significantly slowed by application of nitrapyrin, a yield response does not result. It was thought that a response might have been obtained had a crop been grown on the poorly-drained area adjacent to the harvested area since appreciable N appeared to have been denitrified at this site. Nitrification inhibition by nitrapyrin varied widely within the same field. The results illustrated the problems involved in predicting whether nitrapyrin application will be effective in reducing nitrogen losses and increasing yields. (Skogerboe-Colorado State)
W79-01849

TRICKLE EMITTER FOR SUBTERRANEAN IRRIGATION,
R. W. Spears.
U.S. Patent No. 4,100,940, 6 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 972, No 3, p 1006, July 18, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Subsurface irrigation, Application equipment, Irrigation efficiency, Drip irrigation.

An irrigation pipeline has emitters equipped with discharge nipples for engagement by flexible hoses to release water at a trickle rate at selected subterranean locations within the radii of the hoses. The nipples may be integral with a plastic manifold that is installed between confronting pipe ends and some of the nipples may be blind nipples that are sheared for activation of the emitters as required to meet increased demand for water. One object of the invention is to increase the width of the area that can be irrigated. Another object of the invention is to make the emitter capable of releasing water into the soil at any desired depth including depths below the level of the pipeline instead of the release being limited to levels above the level of the pipeline. This capability makes it unnecessary to bury the pipeline at a depth below the level at which the water is to be released. (Sinha - OEIS)
W79-01860

MASTER-SATELLITE IRRIGATION CONTROL SYSTEM WITH REMOTE PROPORTIONAL TIMING,
Clemar Mfg. Corp., Glendora, CA. (Assignee).
R. L. Ryggles, and V. Panday.
U.S. Patent No. 4,101,786, 13 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 972, No 3, p 1266, July 18, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Water control, Control systems, Remote control, Instrumentation, Timing, Rates of application, Electronic equipment.

An apparatus and a related method are described for proportionately varying from a master unit the durations of irrigation at valve stations controlled by a number of satellite units. Control signal for starting a programmed sequence of valve operations at all of the satellites in a selected one of two groups of satellites, or for resetting all of the satellites to a 'home' postion are transmitted over a single pair of wires. One embodiment of the invention includes adjustable timing circuitry in the master unit to generate a timing signal which is transmitted to the satellite units over a separate wire, and is utilized to vary the duty cycle of a station timing motor which measures the durations of irrigation. In an alternate counter, and the irrigation times at all of the stations can be varied to the same degree by adjustment of a variable-frequency pulse generator at the master unit. (Sinha - OEIS)
W79-01861

FLOW CONTROL DEVICE FOR AN IRRIGATION DITCH,
Rhode (Richard), Glasgow, MT. (Assignee).
G. L. Graham.
U.S. Patent No. 4,103,495, 4 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 57, August 1, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation ditches, *Flow control, Irrigation efficiency, Irrigation practices, Water distribution(Applied), Conduits.

A device is described for controlling the flow of water between an irrigation ditch and an adjacent

field. A conduit has a first end opening into the irrigation ditch and a second end opening into the field to be irrigated. The cover is pivotally attached to the first end of the conduit by means of a 'J'-shaped hinge. A handle is provided on the exterior of the cover and can be engaged by a manually-held instrument to pivot the cover to a position above the conduit where it will rest due to the configuration of the hinge part. The conduit is positioned relative to the irrigation ditch such that the first end is recessed inwardly of one side wall of the ditch and extends below the bottom wall of the ditch. (Sinha-OEIS)
W79-01868

ROTARY SPRINKLER IMPACT ARM SPRING ADJUSTMENT,
Telsco Industries, Dallas, TX. (Assignee).
H. C. Ridgway.
U.S. Patent No. 4,103,828, 9 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 170-171, August 1, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Application equipment, Water delivery, Irrigation efficiency, Irrigation practices.

A rotary sprinkler is provided with structure for adjusting the force applied to the impact arm by the impact arm spring. The sprinkler has a laterally directed nozzle cooperating with the arm to rotate the nozzle and an impact arm journaled on a shaft extending above the nozzle. The arm is mounted within a cage extending above the nozzle. The cage includes a pair of arms extending from the nozzle on opposite sides of the shaft and terminating at their upper ends remote from the nozzle in a top plate. A helical spring surrounds the shaft and is secured at its lower end to the arm. A bushing assembly is mounted in the top plate of the cage and receives the top end of the spring. The bushing assembly may be manually adjusted relative to the top plate to vary the force applied by the spring to the impact arm. The sprinkler is mounted in a bucket-like housing positionable within the ground such that the mouth of the housing is flush with the ground surface. The sprinkler responds to the passage of water through the nozzle by rising from a lower first position retracted in the housing to a raised second position out of the housing. A top cover sized to mate with the mouth of the housing is attached to the top plate of the cage such that when the sprinkler is in the first position the top cover mates with the mouth of the housing to enclose the sprinkler. (Sinha-OEIS)
W79-01872

REGULATED FLOW-REDUCING DEVICE PARTICULARLY USEFUL FOR DRIP IRRIGATION,
M. Drori.
U.S. Patent No. 4,105,162, 6 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 613, August 8, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, Flow control, Irrigation efficiency, Application equipment, Drip irrigation.

A regulated flow-reducing device particularly useful for drip irrigation comprises a flow-retarding member in a housing. The member is formed with a circuitous fluid flow pathway defined at least in part by recesses formed in both its opposed faces. A flat regulator member is placed between the flow-retarding member and the housing inlet such that the inlet face of the regulator member is subject to the fluid pressure at the inlet of the housing. The flat regulator member is in contact with and covers the inlet face of the flow-retarding member except for its inlet end to provide communication between the latter and the housing inlet. The flow retarding member is made of resilient material so that both its recessed faces are deformable by the inlet pressure whereby the cross-sectional area of the recesses on both faces of the flow-retarding member are varied in accordance with the inlet pressure. (Sinha-OEIS)
W79-01882

FORAGE YIELD AND FERTILIZER RECOVERY BY THREE IRRIGATED PERENNIAL GRASSES AS AFFECTED BY N FERTILIZATION,
Agricultural Research Service, Boise, ID. Northwest Water Research Center.
C. L. Hanson, J. F. Power, and C. J. Erickson.
Agronomy Journal, Vol. 70, No. 3, p 373-375, May-June, 1978. 3 tab, 5 ref.

Descriptors: *Forage grasses, Hay, Nitrogen, *Fertilization, Crop response, South Dakota, Clays.

The purpose of this study, conducted in western South Dakota on heavy clay soils was to determine forage yield responses and N recovery of three irrigated grasses--reed canarygrass, garrison creeping foxtail, and smooth brome--to single and split N applications. Single N treatments consisted of 0, 56, 112, 224, or 448 kg N/ha applied in March. For the split N applications, these same rates were applied both in March and again after the first hay cutting. Forage yields were maximunm when the grasses were fertilized with 224 kg N/ha in the split applications. First cutting forage N percentage varied between 0.8 to 2.8 for N rates of 56 kg N/ha and above. The percentage of N was highest, frequently over 3%, in second cutting forage from treatments receiving split fertilizer applications. Percent total N recovered increased as fertilizer applications. Percent total N recovered increased as fertilizer rate increased when all N was applied in March, but recovery was highest for the split application of 224 kg N/ha. (Skogerboe-Colorado State)
W79-01885

NITROGEN LOSSES FROM SPRINKLER-APPLIED NITROGEN FERTILIZER,
Nebraska Univ., North Platte. Dept. of Agronomy.
G. W. Hergert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 364, Price codes: A04 in paper copy, A01 in microfiche. Nebraska Water Resources Center, University of Nebraska, Lincoln, Project Completion Report, September 1978, 47 p, 6 fig, 28 tab, 11 ref. OWRT A-045-NEB(1), 14-34-0001-8029.

Descriptors: *Nitrogen, *Fertilizers, Irrigation, *Nitrates, Water quality, *Sprinkler irrigation, *Irrigation practices, *Fertilization, Soil treatment, Water pollution control.

The objective was to examine nitrogen fertilization and irrigation practices on sandy soils with the goal of quantifying losses of nitrogen from sprinkler-applied nitrogen fertilizer. No significant effect of two different irrigation levels or two nitrogen sources on dry matter accumulation or grain yield was shown. The lack of a treatment effect from the irrigation treatments is encouraging because it indicates that optimum corn yields may be obtained with somewhat limited water application. The nitrate-nitrogen concentration in extracted soil water was high. Average nitrate-N concentrations in deep percolating soil water ranged between 70 and 107 ppm. Nitrate-N accounted for essentially all of the leached mineral nitrogen. Leaching losses in 1976 were 26 and 187 kg N/ha for the low and excess irrigation treatments, respectively. Losses in 1977 were 101 kg N/ha and 127 kg N/ha for the low and excess treatments. No appreciable volatilization of nitrogen from the sprinkler applied nitrogen fertilizer occurred. The development of management practices to limit groundwater enrichment with nitrate entails a complete understanding of realistic crop yield potentials, nitrogen requirements for that yield goal and proper water management to insure minimal leaching losses of nitrogen. Detailed management guidelines are discussed.
W79-01893

THE IMPACT OF ENERGY SHORTAGE AND COST ON IRRIGATION FOR THE HIGH PLAINS AND TRANS PECOS REGIONS OF TEXAS,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
R. D. Lacewell, G. D. Condra, D. C. Hardin, L. Zavaleta, and J. A. Petty.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 362, Price codes: A04 in paper copy, A01 in microfiche. Texas Water Resources Institute, Texas A&M University, Technical Report No. 98, September 1978, 63 p, 17 tab, 38 ref. OWRT A-037-TEX(3), 14-34-0001-7091, 7092 and 8046.

Descriptors: *Energy costs, Efficiency, *Irrigation, Groundwater, Pumping, Irrigation distribution, Linear programming, Simulation analysis, *Texas, *Economic impact, Irrigation practices, *Model studies, Irrigation efficiency, Irrigation water, *Texas High Plains, *Texas Trans Pecos, Irrigated agriculture, Temporal analysis.

Results derived from three models to evaluate expected effect of increasing fuel price, fuel curtailment and risk are presented for the Texas High Plains and Trans Pecos. Increasing natural gas price could reduce the value of groundwater by 50 percent. In the Trans Pecos, with the assumption that energy prices would rise faster than crop prices, average economic life expectancy of a typical farm is estimated to be about five years. Implication of rising natural gas price is dramatic and emphasizes the serious need to become more efficient in use of irrigation water. Annual savings resulting from improved efficiency in pumping and applying irrigation were estimated to be several million dollars.
W79-01894

TEMPERATURE DEPENDENCE OF WATER UPTAKE BY PLANT ROOTS,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2I.
W79-01910

RADIATION AND ENERGY BALANCE OF SPRINKLER AND TRICKLE IRRIGATED FIELDS,
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Inst. of Soil and Water.
J. Ben-Asher, M. Fuchs, and D. Goldberg.
Agronomy Journal, Vol 70, No 3, p 415-417, May-June, 1978. 1 fig, 2 tab, 13 ref.

Descriptors: Water conservation, *Sprinkler irrigation, Tomato, Evaporation, *Evapotranspiration, Energy budget, *Radiation, *Albedo, *Trickle irrigation.

Water conservation claims in favor or trickle irrigation are poorly documented. The radiation and energy balance of tomatoes grown on sand dune soil and on bare soil irrigated by sprinkling and trickling were compared. Under trickle irrigation, the average ratio of five energy balance measurements of evapotranspiration over evaporation pan (Class A) was 0.3, compared with 0.60 obtained under sprinkler irrigation. The comparison of radiation balance over the trickle and sprinkler irrigated plots indicates that the increased radiant heat loss and albedo from the dry portion of the trickle irrigated plot decreases the available evaporative energy at ground level. The smaller radiant heat load combines with the resistance of the dry soil to water flux to reduce the evaporation of the trickle irrigated plot. (Skogerboe-Colorado State)
W79-01990

SUNFLOWER YIELD AND WATER USE AS INFLUENCED BY PLANTING DATE, POPULATION, AND ROW SPACING,
Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center.
J. Alessi, J. F. Power, and D. C. Zimmerman.
Agronomy Journal, Vol 69, No 3, p 465-469, May-June, 1977. 4 fig, 4 tab, 8 ref.

Descriptors: Crop response, *Crop production, Temperature, Agriculture, North Dakota, *Sunflowers, *Cultivation.

Sunflower has only recently been grown commercially as an oilseed crop in the drier regions of the Northern Great Plains. This study was conducted to acquire preliminary information on seed yield, oil concentration, and water use for oil-type sunflower as affected by planting date, plant population, and row spacing; and to obtain an indication how these results were affected by yearly variation in precipitation and air temperature. (Skogerboe-Colorado State)
W79-01999

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

INFORMATION FOR RESERVOIR CONTROL IN THE NORTHUMBRIAN WATER AUTHORITY,
Northumbrian Water Authority, Gosforth (England). Directorate of Planning and Scientific Services.
J. Edwards, and P. Johnson.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 3, p 207-216, May 1978. 7 fig, 2 tab, 1 ref.

Descriptors: *Reservoir operation, *Water supply, *Water management(Applied), *Water control, Water resources, Hydrology, Markov processes, Planning, Foreign research, Methodology, Reservoir releases, Regulation, Reservoir storage, Water yield, Reservoir yield, Risks, Droughts, *Great Britain.

A method of deriving information for control of reservoirs during normal conditions or a drought was proposed. The method is based on assigning a Markov Chain structure to reservoir monthly inflows. The method was demonstrated to give useful results for direct supply or river regulating reservoirs. The sensitivity of the method to the acceptable reliability of supply and the relationship between the reservoir release rate, the refill characteristics of the reservoir, and the supply planning horizon were discussed. The inaccuracies in the theory and the data used for the method were outlined. Conversion of control information into control rules was seen as the next development. It is the choice of acceptable risk which will eventually govern control rules. Since this is related to the value of water, it will be necessary to represent the value in some measurable form, and to incorporate with it in a unified objective function three important features associated with failing to meet demand: (1) restriction of supply beyond a nominal threshold beyond which restriction becomes a major disturbance; (2) duration of this restriction; and (3) frequency of its occurrence. The form of this function and how it reflects on control strategy are matters for further investigation. (Humphreys-ISWS)
W79-01502

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY,
Alabama Univ., University. Dept. of Chemical and Metallurgical Engineering.
G. C. April, D. O. Hill, H-A. Liu, S. Ng, and S. E. Slocovich.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-15473, Price codes: A07 in paper copy, A01 in microfiche. Report BER 209-112, December 1976. 128 p, 52 fig, 23 tab, 14 ref. NAS 8-29100.

Descriptors: *Alabama, *Planning, *Water resources, *Mathematical models, *Computer models, *Water quality, *Estuarine environment, Remote sensing, Mixing, Intertidal areas, Saline water-freshwater interfaces, Sediment transport, Hydrology, Water pollution, Salinity, Coliforms, Flow rate, Hydrodynamics, *Mobile Bay(Ala), Physio-chemical processes.

Due to the continuing interest in the application of remote sensing, automatic data processing, modeling, and other aerospace related technologies to hydrological engineering and water resources management, an investigation was made that included major hydrological and water resource emphasis for the entire river drainage system which feeds the Mobile Bay estuary, Alabama. The adaptation and implementation of existing mathematical modeling for the purpose of describing the behavior of Mobile Bay were investigated. Of particular importance are the interactions that system variables such as river flow rate, wind direction and speed, and tidal state have on the water movement and quality within the bay system. Programs for the digital computation of these models require minimum effort for utilization. Predictive capabilities are consistent with expectations and are adequate for trend analysis. These analyses may include the assessment of man's activities on bay behavior. (Lardner-ISWS)
W79-01510

SUMMARY REPORT OF THE PILOT STUDY PROGRAM, GREAT LAKES SHORELAND DAMAGE STUDY,
Corps of Engineers, Chicago, IL. North Central Div.
L. D'Alba, and T. Hempfling.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 101, Price codes: A07 in paper copy, A01 in microfiche. Final Report, May 1976. 110 p, 12 fig, 54 tab, 3 ref.

Descriptors: *Great Lakes, *Lake shores, *Erosion, *Lake Michigan, *Lake Huron, *Lake Superior, *Lake Ontario, Shore protection, Damages, Erosion control, Lakes, Bank erosion, Beach erosion, Surveys, Data collections, Data processing, On-site investigations, Economics, Costs, Benefits, Sampling, Flood damage, Statistical methods, Shores, Coasts, Model studies, Cost-benefit analysis, Damages, *Coastal zone management, Pilot study program.

This report described the results of a pilot study of damages in 11 Great Lakes counties for the high water period 1972-1974. The purpose of the pilot program was to develop a reliable and inexpensive reconnaissance data collection method, to initiate coordination between the Corps of Engineers and responsible state and local agencies, and to gather the damage data for the 11 counties. The pilot program helped demonstrate how to streamline some of the data collection methods and pointed out ways to substitute for or eliminate other activities. Total damages resulting from the 1972-1974 high water period seem to be in the magnitude of two to three greater (after adjusting for price level changes and development) than damages for the 1951-1952 period for the 11 counties studied. The most significant conclusion that can be made is that it is not possible to make a comprehensive factual survey and evaluation of shoreline processes, effects, and damages without adequate funds, technical staff, and a suitable time framework for conduct of the study. Data collections for this study are published in 9 appendixes. (See W79-01529 thru W79-01534; W77-10904 and W77-10905) (Humphreys-ISWS)
W79-01528

GREAT LAKES SHORELINE DAMAGE SURVEY, SAINT LOUIS COUNTY, MINNESOTA, APPENDIX I.
Arrowhead Regional Development Commission, Duluth, MN.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 262, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Army Corps of Engineers, Chicago, Ill., North Central Div., Final Report, May 1976. 106 p, 17 tab, 2 ref, 4 append. DACW 23-75-C-0023.

Descriptors: *Great Lakes, *Minnesota, *Lake Superior, *Lake shores, *Erosion, Surveys, Land use, Shore protection, Property values, Flood damage, Beach erosion, Bank erosion, Data collections, On-site investigations, Water quality, Lakes, Coasts, Damages, *Saint Louis County(Minn), Pilot study program.

This is a report of a study of St. Louis County, Minnesota, where shoreland damages were caused by or directly related to the 1972-1974 high water period on the Great Lakes. The report covered one of 11 county pilot studies initiated around the Great Lakes to study shoreland damage. Damage information, consisting of personal and real property loss and their associated costs, has been documented based on self-administered assessments, personal interviews, and field reconnaissance. St. Louis County's North Shore riparian owners were cooperative and eager to provide information. The response rates to survey instruments was 67% for residential owners and 65% for non-residential parcel owners. About two-thirds of the residential and non-residential parcels have been subject to either erosion or flooding during the two year study period. Aerial photo mosacis of county shorelands were included. (See W79-01528) (Humphreys-ISWS)
W79-01529

GREAT LAKES SHORELINE DAMAGE SURVEY; BROWN, DOUGLAS, AND RACINE COUNTIES, WISCONSIN, APPENDIX II,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
N. P. Lasca, R. G. Pirie, P. C. Tychsen, and G. A. Fowler.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 263, Price codes: A16 in paper copy, A01 in microfiche. Final Report, May 1976. 259 p, 11 fig, 79 tab, 16 ref, 79 plates. DACW 23-75-C-0028.

Descriptors: *Great Lakes, *Wisconsin, *Lake Michigan, *Lake Superior, *Lake shores, Surveys, Erosion, Shore protection, Bank erosion, Flood damage, Beach erosion, Data collections, On-site investigations, Coastal structures, Costs, Sea walls, Retaining walls, Groins(Structures), Damages, *Brown County(Wis), *Douglas County(Wis), *Racine County(Wis), Pilot study program.

This report is a study of Brown, Douglas, and Racine Counties, Wisconsin, where shoreland damages were caused by or directly related to the 1972-1974 high water period on the Great Lakes. The 41 miles of shoreline bordering Brown County on Green Bay are prone to both flooding and bluff erosion. Approximately 1/2 of the shoreline, the shore west of the Fox River, is primarily affected by flooding, while the remaining half, the shore east of the Fox River, is primarily affected by water wave erosion of the low-lying to moderately high bluffs. Bluff recession along the Douglas County shoreline is highly variable, ranging from 38 to 239 feet during the period 1938 to 1973. The mean rate of shore retreat was 95.3 feet during the 35-year period. Virtually the entire length of Racine County's 15 miles of shore suffered damage to some degree in the period Labor Day 1972 to Labor Day 1974 through the erosive action of high storm waves developed on an unusually high lake surface. Aerial photo mosaics of county shorelands also were included. (See also W79-01528) (Humphreys-ISWS)
W79-01530

GREAT LAKES SHORELINE DAMAGE SURVEY; MUSKEGON, MANISTEE, SCHOOLCRAFT, CHIPPEWA, ALCONA, AND HURON COUNTIES, MICHIGAN, APPENDIX III,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
J. M. Armstrong, M. R. McGill, A. M. Kubeck, C. K. Barber, and J. F. Gillette.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 456, Price codes: A13 in paper copy, A01 in microfiche. Final Report, May 1976. 306 p, 21 tab, 66 plates. DACW 23-75-C-0027.

Descriptors: *Great Lakes, *Michigan, *Lake shores, *Lake Michigan, *Lake Superior, *Lake Huron, Surveys, Flood damage, Damages, Erosion, Shore protection, Beach erosion, Bank erosion, Data collections, On-site investigations,

Coastal structures, Costs, *Muskegon County(Mich), *Manistee County(Mich), *Schoolcraft County(Mich), *Chippewa County(Mich), *Alcona County(Mich), *Huron County(Mich), Pilot study program.

This is a report that identifies erosion and flood damage in the six named counties caused by or directly related to the 1972-1974 high water period on the Great Lakes. The short-term objective of this study was to determine the financial loss in the State of Michigan due to high water-induced effects of flooding and erosion. The long-range goals include such items as development of planning decision tools, coastal zone management programs, and land use studies for reduction of damage or loss resulting from high water levels. Aerial photo mosaics of county shorelands also were included. (See also W79-01528) (Humphreys-ISWS)
W79-01531

ENGINEERING STUDIES FOR A CONTRACT FOR FIELD INVESTIGATION OF HIGH WATER DAMAGE IN OSWEGO COUNTY, NEW YORK, APPENDIX IV,
Saint Lawrence-Eastern Ontario Commission, Watertown, NY.
D. J. Palm.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 079, Price codes: A10 in paper copy, A01 in microfiche. Final Report, May 1976. 149 p, 4 fig, 14 tab, 3 append, 26 plates. DACW 23-75-C-0033.

Descriptors: *Great Lakes, *New York, *Lake Ontario, *Lake shores, Flood damage, Damages, Erosion, Beach erosion, Surveys, On-site investigations, Data collections, Shore protection, Coastal structures, Land use, Costs, High water mark, *Oswego County(NY), Pilot study program.

This report is a study of Oswego County, New York, where shoreland damages were caused by or directly related to the 1972-1974 high water period on the Great Lakes. The shoreline is primarily in private ownership and land values are generally low due to the predominance of seasonal residences and undeveloped land. The entire shoreline has been impacted by flooding and erosion. The magnitude depended primarily on land form and land use. Damages occurred over the entire shoreline. The majority were sustained by seasonal residences and commercial and industrial users. The most severe damages were to grounds and improvements for seasonal residences and net business losses for commercial and industrial uses. The findings of this study reflect that information on damage to structures and physical property is available. Information on the impact on the natural environment of erosion and flooding accompanying high lake levels is not available. Aerial photo mosaics of county shorelands also were included. (See also W79-01528) (Humphreys-ISWS)
W79-01532

MEASUREMENT OF COASTAL BLUFF RECESSION FROM AERIAL PHOTOGRAPHS, MUSKEGON COUNTY, MICHIGAN, APPENDIX VII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
B. A. Stoker.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 080, Price codes: A04 in paper copy, A01 in microfiche. Final Report, May 1976. 65 p, 26 fig, 6 tab, 16 ref, 3 append, 3 photo. DACW23-75-C-0027.

Descriptors: *Great Lakes, *Lake Michigan, *Michigan, *Bank erosion, *Lake shores, Surveys, Erosion, Measurement, On-site investigations, Data collections, Aerial photography, Methodology, Erosion rates, Beach erosion, Terrain analysis, Photogrammetry, Data processing, Remote sensing, Analytical techniques, *Muskegon County(Mich), Pilot study program.

This report evaluated the usefulness of aerial photographs in the determination of coastal erosion rates. The effectiveness of aerial photographs was examined in terms of availability, type of coverage, and the reliability of the measurements obtained from the photographs. The methods employed were designed to minimize measurement errors by using an accurate measuring instrument and by taking the mean value of three measurements. Tilt errors were minimized by using ground distances to determine photo scales near each site. Relief displacement errors were corrected for where needed, and measurements with location errors were noted. Location errors are considered the most critical because they can not be minimized. The most accurate methods for recession studies would require first order plotting instruments using advanced photogrammetric techniques. The costs involved would by far outweigh any practical application of the information. Only 'ball park' values of rates can be obtained under two possible situations using the methods outlined: when a great deal of erosion occurs over a short period of time, or when measurements are made over a long time interval. Indications of rapid recession over a short time interval usually can be detected by simple observation of the aerial photographs. (See also W79-01528) (Humphreys-ISWS)
W79-01533

COMPARISON OF FIELD DATA COLLECTIONS TO DATA COLLECTED USING STUDY INSTRUMENTS IN MUSKEGON AND MANISTEE COUNTIES, MICHIGAN, APPENDIX VIII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
J. M. Armstrong, M. R. McGill, and J. F. Gillette.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-031 261, Price codes: A02 in paper copy, A01 in microfiche. Final Report, May 1976. 6 p, 4 tab. DACW 23-75-C-0027.

Descriptors: *Great Lakes, *Erosion, *Michigan, *Data processing, *Lake shores, Statistical methods, On-site data collections, Analytical techniques, Analysis, Distance, Height, Dimensions, Value, Property values, Real property.

The Coastal Zone Laboratory conducted tests in Muskegon and Manistee Counties to compare homeowner perceptions reflected in the self-administered damage assessment with independent measurements. Data were collected and compared from a sample of homeowners in the following categories: present property worth, bluff height, and the distance from the bluff edge to the foundation of the house. These parameters were chosen because they typify homeowners perceptions of monetary value, vertical distance, and horizontal distance. Results of statistical analysis were tabulated. (See also W79-01528) (Humphreys-ISWS)
W79-01534

ANALYSIS OF SEASONAL PERSISTENCE OF CLIMATE IN NEBRASKA,
Nebraska Univ., Lincoln. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W79-01538

OPTIMAL REGULATION POLICIES FOR A MULTIPURPOSE RESERVOIR WITH SEASONAL INPUT AND RETURN FUNCTION,
California Univ., Los Angeles. Dept. of System Science.
S. Arunkumar.
Journal of Optimization Theory and Applications, Vol. 21, No. 3, March 1977, p 319-328. 1 fig, 4 ref. (California Water Resources Center Project UCAL-WRC-W-341). OWRT A-043-CAL(3).

Descriptors: *Storage theory, Dynamic programming Water resources, Reservoirs, *Multipurpose reservoirs, *Regulation, *Optimization, Reservoir operation, Water policy.

Optimal regulation policies for a multipurpose reservoir are characterized analytically for the case where the input and return functions are subject to seasonal variations and the return function is piecewise linear, concave, and separable in reservoir volume and discharge. Efficient upper and lower bounds on optimal policies are derived from two important special cases. Necessary and sufficient conditions are obtained for a finite-time horizon optimal policy to be also optimal for the infinite-time horizon. (Snyder-Calif, Davis)
W79-01570

IMPROVEMENT AND EVALUATION OF TECHNIQUES FOR THE MECHANICAL REMOVAL AND UTILIZATION OF EXCESS AQUATIC VEGETATION,
Wisconsin Univ.-Madison. Dept. of Mechanical; and Wisconsin Univ.-Madison. Dept. of Agricultural Engineering.
R. G. Koegel, D. F. Livermore, and H. D. Bruhn.
Technical Report, 1978. 69 p, 5 tables, 25 figs, 17 refs. GI 39193, NSF, RANN.

Descriptors: *Aquatic vegetation, *Rooted aquatic plants, *Water harvesting, *Productivity, *Mechanical equipment, *Treatment, *Feeds, Wisconsin, *Dane County(Wisc).

This report describes the development and evaluation of equipment and systems with potential for increasing the cost effectiveness of aquatic plant harvesting. These include accessories and processing equipment to increase the productivity of existing harvesting systems as well as the development of nonconventional systems. In addition, a number of options for utilization of the harvested vegetation are described. Biological and limnological effects of harvesting are discussed.
W79-01584

THE PRODUCTION OF PULP FROM MARSH GRASS,
Mississippi State Univ., Mississippi State. Dept. of Zoology.
A. A. de la Cruz.
Economic Botany, Vol. 32, No. 1, p 46-50, January-March, 1978. 3 fig, 5 ref.

Descriptors: *Pulp and paper industry, *Rooted aquatic plants, *Harvesting, Crops, Marshes, Wetlands, Aquatic plants, Paper industry, Grasses, Romania.

The Romanian Government had developed and constructed machinery for the large-scale processing of red (Phragmites communis) pulp. The annual harvest of 125,000 tons of dry weight raw reed is based on an ecologically sound natural cycle of reed production. When processed, raw reed yields up to 60% in unbleached pulp which is mixed with wood pulp in the production of fabricated paper. At $85.00/ton of raw reed material, the reed pulp industry amounts to over $10 million annual revenue. (Sthiler Mass)
W79-01630

THE TIMELINESS BENEFIT OF SUBSURFACE DRAINAGE,
Soil Conservation Service, Kankakee, IL.
For primary bibliographic entry see Field 3F.
W79-01728

ON OPTIMAL REGULATION POLICIES FOR CERTAIN MULTI-RESERVOIR SYSTEMS,
California Univ., Los Angeles.
S. Arunkumar, and K. Chon.
Operations Research, Vol. 26, No. 4, p 551-562, July-August 1978. 2 fig, 1 tab. OWRT A-043-CAL(4).

Descriptors: *Reservoirs, *Regulation, *Water policy, *Optimization, Benefit maximization, Heuristic approach, Hydrologic aspects, Dams, Reservoir releases, Operations research, Mathematical models.

Optimal regulation policies for two reservoirs, connected in series, with seasonal and possibly cross-correlated inflows, and analytically characterized when the immediate reward function is a piecewise linear concave function of the release and the objective is to mazimize the expected discounted rewards over finite and infinite time horizons. The optimal policies are expressed in terms of certain critical numbers for which upper

and lower bounds are obtained. Proposed is a heuristic approach for multi-reservoir systems under less restrictive assumptions; it is applied to two reservoirs connected in parallel. (Bell-Cornell)
W79-01731

MORPHOLOGICAL VARIATION OF ELODEA IN WESTERN MASSACHUSETTS: FIELD AND LABORATORY STUDIES,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01743

THE SPREAD OF SEVERAL INTRODUCED OR RECENTLY INVADING AQUATIC IN WESTERN MASSACHUSETTS,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01744

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL, AND CLIFTY CREEK AND PATOKA RIVER, IN, VOL. I: REPORT.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01827

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL, AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. II: APPENDICES A-C.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01828

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL., AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. III, APPENDICES D-F.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01829

WABASH RIVER BASIN COMPREHENSIVE STUDY. VOL I. MAIN REPORT,
For primary bibliographic entry see Field 6B.
W79-01830

PHYSICAL AND ECONOMIC FEASIBILITY OF NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W79-01833

WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
For primary bibliographic entry see Field 8C.
W79-01835

A LAND STUDY FOR DOWNTOWN LAKE CHARLES,
Houston Univ., TX. Coll. of Architecture.
For primary bibliographic entry see Field 6B.
W79-01838

THE UPPER COLUMBIA NAVIGATION PROPOSAL.
Cornell, Howland, Hayes and Merryfield, Bellevue, WA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 615, Price codes: A07 in paper copy, A01 in microfiche. Prepared for the Inland Empire Waterways Associaton, Walla Walla, WA, May 1970, 118 p, 3 maps, 12 fig, 41 tab.

Descriptors: *Cost-benefit analysis, *Feasibility studies, *Water resources development, *National income, *Regional development, *Washington, Environmental effects, Social values, Social impact, Recreation, Transportation, Employment, Unemployment, Discount rates, Project feasibility, *Upper Columbia River(WA), Freight traffic, Project life.

The purposes of this study were to make an independent evaluation of the economic and social feasibility of the proposed Upper Columbia navigation extension (125 miles up the Columbia River) and to test the revised procedures of the Special Task Force of the National Water Resources Council. The analysis included: (1) current economic profile of the area immediately affected; (2) results of an evaluation of transportation savings and other income effects from a national viewpoint; (3) regional income effects; (4) expected environmental effects; (5) the project's effect on the wellbeing of people; (6) length of evaluation of project life and the relevance of salvage value and continual maintenance; and (7) the effect of increasing river flow on dredging costs. Objectives to be given equal weight when judging a project for federal funding include: national income; regional development; environmental enhancement; and wellbeing of people. Conclusions indicate that substantial savings from the proposed waterway navigation may exist; that recreational boating would be enhanced; that unemployment in the region would be normally relieved; that proper planning and management during channel dredging would minimize effects of the natural environment; and that the social well-being of the nation may be enhanced by higher rates of economic and population growth, relieving pressure on overcrowded areas. The results are expected to be useful in further consideration of the value of this project and in judging the operational significance of the suggested revised procedures for evaluation of water resource projects. (Coan-NC)
W79-01843

FLOOD PLAIN INFORMATION: PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for the Bentleyville-Fallowfield Regional Planning Commission, PA, March 1968, 27 p, 2 fig, 9 plates, 8 tab.

Descriptors: *Pennsylvania, *Flood forcasting, *Stage-discharge relations, Floods, Indirect flood measurement, Historic floods, Flood data, Flood recurrence interval, Flood stages, Peak discharge, Flood peak, Flow duration, Standard project flood, Somerset(PA), Bentleyville(PA), Fallowfield(PA), *Pigeon Creek(PA), Intermediate regional flood.

The study area is the Pigeon Creek flood plain located in Fallowfield Township, Somerset Township, and Bentleyville in Washington County, Pennsylvania. The flood plain is generally narrow with the widest portion in the Bentleyville Area. Damageable development in the study area is contained primarily in Bentleyville and consists of residential and commercial establishments. Flood data were obtained from maps, interviews with local residents, newspaper files and historical records. There are no existing flood plain regulations in the study area and no existing, authorized or proposed flood control measures in the surrounding watershed. The main flood season for Pigeon Creek is in winter and early spring. Floods generally result from heavy rains and rapid snowmelt but occasionally are caused by intense thunderstorms. The greatest flood on Pigeon Creek occurred at Bentleyville on August 5, 1956, with a peak discharge of 4,100 cubic feet per second (cfs). The Intermediate Regional Flood is estimated to have a discharge of 5,000 cfs near the Van Voorhis Highway bridge. At the same location, the Standard Project Flood would have an average discharge of 9,000 cfs. This report provides a basis for further study and planning to minimize vulnerability to flood damages. (Coan-NC)
W79-01850

FLOOD HAZARD INFORMATION: CLOVER CREEK, STILLWATER CREEK AND STILLWATER CREEK TRIBUTARIES, LOOMIS CORNERS, CALIFORNIA.
Army Engineer District, Sacramento, CA.
Prepared for Shasta County, CA., October 1977, 12 p, 4 fig, 16 plates, 5 tab.

Descriptors: *California, *Flood forecasting, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Flood profiles, Historic floods, Flood data, Flood stages, Flood peak, Flow characteristics, Flood damage, Erosion, Deposition(Sediments), Flood protection, Flood plain zoning, Zoning, Dams, *Clover Creek(CA), *Stillwater Creek(CA), Loomis Corners(CA), Sacramento River(CA), Shasta County(CA), 100-year flood, 500-year flood.

The study area includes the flood plains of Clover Creek from Hartnell Avenue to River Valley Drive, Stillwater Creek, and the lower reaches of Salmon and Clough Creeks in the vicinity of Loomis Corner's in Shasta County, CA. These creeks are tributaries of the Sacramento River. The streams together drain approximately 70 square miles. Development in the study area may be generally classified rural and rural-residential with very limited commercial activity. Flood data were gathered from topographical maps, newspaper files, and various governmental agencies. The only existing flood control project having an effect on the study area is Shasta Dam, located on the Sacramento River in the foothill region north of the study area. Information on past floods is very limited because neither streamflow records nor eyewitness accounts are available. Flooding generally results from prolonged winter rainstorms occurring anytime during the period November through March. Flood hazards along Clover Creek are minimal and could be handled by channel alterations. All 7 of the road bridges across Stillwater Creek are considered obstructive to flood flows. Peak flows for the 100-year flood and 500-year flood on Stilldwater Creek at Dersch Road would be 21,000 cubic feet per second (cfs) and 29,000 cfs, respectively. on Salmon Creek at Old Alturas Road peak flows would be 2,100 cfs and 2,900 cfs for the 100-year and 500-year floods, respectively. This report will aid in planning the best use of lands subject to inundation from 100- and 500-year floods. (Coan-NC)
W79-01851

FLOOD PLAIN INFORMATION: SALT CREEK AND TRIBUTARIES, OLNEY, TEXAS.
Army Engineer District Fort Worth, TX.
Prepared for City of Olney, TX, June 1976, 35 p, 6 fig, 11 plates, 8 tab.

Descriptors: *Texas, *Flood data, Floods, Floodwater, Flood flow, River flow, Indirect flood measurement, Flood forecasting, Historic floods, *Peak discharge, Flood stages, Flow duration, Stage-discharge relations, Flood damage, Flood protection, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Zoning, Control structures, Dams, Reservoirs, Floodproofing, *Salt Creek(TX), Olney(TX), Mud Creek(TX), 100-year flood, 500-year flood. Flood plain management.

The study area is the watershed of Salt Creek near Olney, Young County, Texas, located in the larger Brazos River Basin. The floodplains of Salt Creek are primarily rural except for residential, industrial, and commercial development located within the city of Olney itself. The sources of flood data include U.S. Geological Survey gaging stations, National Weather Service records, topographical maps, and historical documents and records. There are no existing structural flood damage reduction measures along Salt Creek or its tributaries. Most of the flood-producing thunderstorms and rainfalls

occur in the spring and early fall, but may occur at any time. Natural obstruction to flood flows include trees, brush, and other vegetation growing along the stream banks in flooding areas. Peak flood discharges were not availble for Salt Creek but the worst flood in the area occurred on the Brazos River near Seymour, Texas, in October, 1926, with a peak discharge of 95,400 cubic feet per second (cfs). The 100-year and 500-year floods on Salt Creek are predicted to reach discharges of 33,300 cfs and 50,000 cfs, respectively below the Willow Pond Circle. Peak discharges for Mud Creek, a tributary of Salt Creek, would be 8,900 cfs for the 100-year flood and 12,400 cfs for the 500-year flood. Guidelines for flood plain management are presented, including both regulatory and nonregulatory methods of flood control. This report is intended to provide information on flood hazards and guidelines for flood plain management. (Coan-NC)
W79-01852

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH, JUNIATA RIVER, CLAYSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
Prepared for Blair County Planning Commission, PA, Feb 1977, 26 p, 11 fig, 14 plates, 4 tab.

Descriptors: *Pennsylvania, *Flood data, *Stage-discharge relations, Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood recurrence interval, Flood stages, Peak discharge, Flood protection, Warning systems, Claysburg(PA), Frankstown Branch(PA), *Juniata River(PA), East Freedom(PA), 100-year flood, 500-year flood, Blair County(PA).

The study area is the portions of the towns of Claysburg and East Freedom, Pennsylvania subject to flooding from the Frankstown Branch of the Juniata River. Properties along these streams are primarily residential, with some commercial and agricultural development. No stream gages are located within the study area. Flood data were gathered from U.S. Geological Survey bench mark listings and newspaer accounts of past floods. Flood from the Frankstown Branch have occurred during all seasons of the year with acute flooding during the spring season, resulting from snowmelt, heavy rains, and some hurricane activity. There are no present plans for flood control projects and no zoning ordinances, building codes or other regulatory measures for the reduction of flood damages. Many of the bridges in the study area are obstructive to flood flows. The worst flood probably occurred on March 18, 1936, but no actual records of discharges or cost of damages were available. Other large floods occurred in 1973, 1954, 1961 and 1972. At the mouth of the Frankstown Branch, the 100-year flood would discharge 16,400 cubic feet per second (cfs), while the 500-year flood would discharge 28,400 cfs at the same location. This study was authorized to provide a basis for the development of flood plain management measures by the Blair County Planning Commission. (Coan-NC)
W79-01853

FLOOD PLAIN INFORMATION: MUDDY BRANCH, MONTGOMERY COUNTY MARYLAND.
Army Engineer District, Baltimore, MD.
Prepared for Maryland-National Capital Park and Planning Commission, June 1972, 21 p, 2 fig, 11 plates, 5 tab.

Descriptors: *Maryland, *Flood stages, *Peak discharge, Floods, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood recurrence interval, Flood peak, Flow duration, Stage-discharge relations, Flood damage, Bank erosion, Standard project flood, Flood protection, Flood plain zoning, Warning systems, Zoning, *Muddy Branch(MD), Montgomery County(MD), Suitland(MD), Gaithersburg(MD), Intermediate Regional Flood.

The study area is the flood plain of Muddy Branch, a tributary of the Potamac River near Gaithersburg, Maryland. The Muddy Branch watershed drains and area of 19 square miles and is located entirely within Montgomery County. Except for highways and bridges, development in the flood plain is limited to scattered residential developments and a commercial-industrial complex. Muddy branch is an ungaged stream so flood data were gathered from interviews with local residents and historical records. There are no existing authorized, or porposed flood control measures in the Muddy Branch area. A county subdivision ordinance restricts residential and commercial development in the 50-year flood plain. Flood data are provided for streams in the vicinity of Muddy Branch. The greatest recorded flood occurred on Seneca Creek, near Dawsonville, in July 1956 discharging 15,000 cubic feet per second(cfs). Flooding occurred in the Muddy Branch flood plain in 1956, 1967, 1969, 1970 and 1971. The Intermediate Regional Flood near the mouth of Muddy Branch would discharge 4,800 cfs, rising to 14.8 feet above streambed. The Standard Project Flood would discharge 10,600 cfs, rising to 22.3 feet above planning on the part of planning agencies trying to minimize flood damages.(Coan-NC)
W79-01854

FLOOD HAZARD INFORMATION: SACRAMENTO RIVER AND COTTONWOOD AND BATTLE CREEKS, COTTONWOOD-BEND AREA, CALIFORNIA.
Army Engineer District, Sacramento, CA.
Prepared for Shasta and Tehama Counties, CA., August 1978, 18 p, 13 fig, 23 plates, 5 tab.

Descriptors: *California, *Flood profiles, *Peak discharge, Floods, Indirect flood measurement, Flood forecasting, Storms, Cloudbursts, Historic floods, Flood data, Flood stages, Flow characteristics, Flood damage, Flood protection, Control structures, *Cottonwood Creek(CA), *Battle Creek(CA), Sacramento Valley(CA), Shasta County(CA), Tehama County(CA), 100-year flood, 500-year flood.

The study area includes the flood plains along the Sacramento River and Cottonwood and Battle Creeks in the Cottonwood-Bend area, Shasta and Tehama Counties, California. The region is in the upper end of the Sacramento Valley, the northern sector of the central valley of California. Development in the flood plain area is primarily limited to residential and agricultural sites. Flood data were gathered from library sources, U.S. Geological Survey topographic maps, newspaper reports, and from other governmental agencies. The main flood control structure is Shasta Dam which provides protection from rainfloods and snowmelt runoff originating in the Sacramento River Basin above Shasta Lake. Flooding generally results from intense widespread storms occurring from November through April, and occasionally, from snowmelt runoff during April through June. Five of the bridges in the study area are considered obstructive to flood flow. The worst flood on the Sacramento River after construction of Shasta Dam occurred in January 1970, discharging 157,000 cubic feet per second (cfs). On Cottonwood and Battle Creeks, the worst floods occurred in January of 1974 and 1970, respectively, discharging 70,000 cfs on Cottonwood Creek and 24,300 cfs on Battle Creek. Peak flows for the 100-year and 500-year floods on the Sacramento River near Bend bridge would be 288,000 cfs and 535,000 cfs, respectively. On Cottonwood Creek the 100-year flood would discharge 106,000 cfs and the 500-year flood, 156,000 cfs, while on Battle Creek the discharge would be 36,200 cfs and 52,400 cfs, respectively. This report will aid in planning the best use of lands subject to inundation from 100- and 500-year floods. (Coan-NC)
W79-01855

FLOOD PLAIN INFORMATION: BIRD CREEK AND TRIBUTARIES, PAWHUSKA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
Prepared for City of Pawhuska, OK, June 1974, 30 p, 7 fig, 11 plates, 5 tab.

Descriptors: *Oklahoma, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Flooding, Flood flow, Historic floods, Flow duration, Flood plains, Standard Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Warning systems, Building codes, Land use, Planning, Control structures, Reservoirs, *Bird Creek(OK), Pawhuska(OK), Intermediate Regional Flood.

The study area includes Bird Creek, its tributaries, and their flood plains in the vicinity of Pawhuska, Oklahoma. Developments in the flood plain include commercial, residential, and industrial land uses. Flood data were obtained from topographic maps, field studies and historical sources. Since no stream gage records were available, flood profile projections were based on data from watersheds in the region with similar characteristics. Intense thunderstorms cause most flooding in the region, from May through October. The worst known flood occurred in 1915. Recent major floods occurred in 1959 and 1974. On Bird Creek, the Intermediate Regional Flood (IRF) would discharge 38,700 cubic feet per second (cfs) and would rise 3.1 feet, while the Standard Project Flood (SPF) would discharge 75,900 cfs and would rise 8.5 feet. A water supply reservoir in the area provides some flood control capacity which results in lowering the water surface elevations of the IRF on Bird Creek through Pawhuska by about 2 feet. No other structural flood control measures are anticipated. Non-structural measures have not been enacted. Guidelines for flood plain management are presented. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-01856

FLOOD PLAIN INFORMATION: PROVO RIVER AND SLATE CANYON CREEK, PROVO, UTAH.
Army Engineer District, Sacramento, CA.
Prepared for Board of County Commissioners, Utah County, UT, May 1972, 34 p, 12 fig, 12 plates, 6 tab.

Descriptors: *Utah, *Flood profiles, *Flood data, *Peak discharge, Floods, Flood flow, Flow characteristics, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Reservoirs, *Provo River(UT), Provo(UT), *Slate Canyon Creek(UT), Utah County(UT), Intermediate Regional Flood.

The study area includes the Provo River flood plain and the Slate Canyon Creek outwash fan in Provo, Utah. Both flood plains contain some residential and commercial developments, but they are mostly devoted to non-intensive land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Deer Creek Reservoir provides incidental flood control. A flood control reservoir has been authorized. Flooding along the Provo River results primarily from snowmelt originating above Deer Creek Reservoir when the reservoir is full. These floods occur from late April through early July. Flooding on the Slate Canyon Creek outwash fan results from high intensity convective-type thunderstorms centered over the tributary area. These floods occur from May through September. The worst flood recorded at the Provo gage occurred on May 6, 1952, discharging 2,520 cubic feet per second (cfs). At the downstream study limit, the Intermediate Regional Flood would discharge 3,000 cfs and would crest at 4494 feet mean sea level (msl), while the Standard Project Flood would discharge 5,200 cfs and would crest at 4494.5 feet msl. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-01857

FLOOD PLAIN INFORMATION: COAL CREEK AND TRIBUTARIES, HENRYETTA, OKLAHOMA.
Army Engineer District, Tulsa, OK.

Group 4A—Control Of Water On The Surface

Prepared for City of Henryetta, OK, August 1975, 24 p, 5 fig, 14 plates, 5 tab.

Descriptors: *Oklahoma, *Flood profiles, *Flood data, *Peak discharge, *Non-structural alternatives, Floods, Flood flow, Historic floods, Flow characteristics, Flood plains, Standard Project Flood, Flood protection, Flood plain zoning, Flood plain insurance, Building codes, Land use, Planning, *Coal Creek(OK), Henryetta(OK), Intermediate Regional Flood.

The study area includes Coal Creek, its tributaries, and their flood plains in the vicinity of Henryetta, Oklahoma. Land use in the flood plain is residential, commercial, and agricultural. Intense thunderstorms cause most floods in the area from April through September. Flood data were obtained from topographic maps, field studies, and historical sources. No stream gage records are available. The worst known flood occurred on April 14, 1945. In the lower study reach, the Intermediate Regional Flood would discharge 12,400 cubic feet per second (cfs) and would rise 12.5 feet, while the Standard Project Flood would discharge 21,200 cfs and would rise 15.5 feet. Historic and projected flood data are also presented for the rest of the study area. Structural flood control measures neither exist nor are they anticipated. Non-structural measures have not been enacted. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W79-01858

FLOOD PLAIN INFORMATION: PANTHER AND BEAR BRANCHES, MONTGOMERY COUNTY, TEXAS.
Army Engineer District, Galveston, TX.
Prepared for Montgomery County, Texas, March 1974, 32 p, 6 fig, 22 plates, 4 tab.

Descriptors: *Texas, *Flood data, *Peak discharge, *Stage-discharge relations, Floods, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood stages, Standard Project Flood, Flood protection, Flood plain zoning, Warning systems, Building codes, Land use, Planning, Zoning, Control structures, *Panther Branch(TX), *Bear Branch(TX), Montgomery County(TX), Flood plain management, Intermediate Regional Flood.

The study area includes the floodplain of Panther Branch extending 16 stream miles northwest from its confluence with Spring Creek, and that of Bear Branch extending 10 stream miles northwesterly from its confluence with Panther Branch. Both streams are located in southeast Montgomery County, Texas, near Houston. Development in the flood plain is primarily agricultural, but because of development pressure in metropolitan Houston, residential and suporting service facilities are being built. There are no stream gage or discharge records available for Panther or Bear Branches. Flood data were collected from newspaper files, topographical maps, and the NOAA Weather Service. Obstructions in the stream flow are both manmade and natural, consisting of road crossings, landfills and bridges, trees, brush, and other vegetation. There are no flood control structures in the study area. Flooding is caused by intense local thundershowers, general storms and hurricanes, all occurring at any time of the year. Recent major floods occurred in 1960, 1961, 1964, 1966, 1968, 1972 and 1973. On Panther Branch, the Intermediate Regional Flood (IRF) would discharge 14,000 cubic feet per second (cfs), rising to 12 ft above the streambed, while the Standard Project Flood (SPF) would discharge 23,000 cfs and rise to 14.9 ft. above streambed. On Bear Branch, the IRF would discharge 8,900 cfs, rising to 12 ft above streambed; the SPF would discharge 14,700 cfs, rising to 14.9 ft. above streambed. Specific guidelines for flood plain management are presented, particularly non-structural alternatives. This report is intended to provide definitive data to aid in planning the best use of flood prone lands, or otherwise contribute to the solution of local flood problems. (Coan-NC)
W79-01859

FLOOD FREQUENCY DESIGN IN SPARSE-DATA REGIONS,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. F. Carlson, and P. M. Fox.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 389, Price codes: A02 in paper copy, A01 in microfiche. Report IWR-94. 1978. 11 p, 6 ref. OWRT B-030-ALAS(2), 14-31-0001-5217.

Descriptors: *Alluvial channels, *Design flood, *Flood frequency, Hydrologic data, Scour, Flood protection, *Design criteria, *Alaska, Risks, Data collections, Pipelines, *Northern region(Alas), *Bayesian analysis, *Sparse data.

The project was directed towards improved techniques for flood capacity design in areas of extremely sparse data such as cold regions. The work included development of the appropriate risk selection with Bayesian analysis techniques. As most flood determination procedure involves some type of model calculation a portion of the work was aimed towards an appropriate model choosing technique. Several techniques were developed to describe the channel dynamics of northern braided rivers with particular emphasis on scour phenomenon and engineering structures. A field review of existing hydraulic engineering design performance examined bridge, culvert, and pipeline crossings along the Alyeska oil pipeline route from Fairbanks to Prudhoe Bay. A Bayesian based risk analysis procedure incorporated the model selection, the design hydrology, the channel geometry and the design demands in such a way so as to provide maximum reliability with very little available data. The report includes abstracts of eight publications which have been prepared as a result of the project.
W79-01901

REMOTE SENSING ASSESSMENT OF DAM *FLOODING HAZARDS: METHODOLOGY* DEVELOPMENT FOR THE NEW YORK STATE DAM SAFETY PROGRAM,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
J. P. Berger, W. R. Philipson, and T. Liang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 371, Price codes: A04 in paper copy, A01 in microfiche. Research Project Technical Completion Report, November, 1978. 61 p, 23 fig, 8 tab. OWRT A-081-NY(1). 14-34-0001-8034.

Descriptors: *Remote sensing, *Dams, *Aerial photography, Satellites(Artificial), *Flood control, *Hazards, Dam failure, *Dam safety programs, *New York, Methodology, Data collections, Mapping, Evaluation, Surveys.

The value and use of remotely sensed aircraft and satellite data for inventorying dams, determining their hazard class, and assessing their condition is described. A methodology is developed to increase the efficiency and accuracy of dam inspection in New York State by incorporating remote sensing techniques into the State Dam Safety Program. The methodology places emphasis on readily available remotely sensed data--aerial photographs and Landsat data. Aerial photographs are employed in establishing a statewide data base, referenced on county highway and U.S. Geological Survey 1:24,000 scale, topographic maps. Data base updates are conducted by region or county, using Landsat or aerial photographs as a primary source of information. Field investigations are generally limited to high-hazard or special problem dams, or to dams which cannot be assessed adequately with aerial photographs. Although emphasis is placed on available data, parameters for acquiring new aircraft data are outlined and various sensors considered. Large scale (1:10,000) vertical, stereoscopic, color-infrared aircraft photography, flown during the spring or fall, is recommended for assessing dam condition.
W79-01980

A MANUAL FOR HYDROLOGIC TIME SERIES DESEASONALIZATION AND SERIAL DEPENDENCE REDUCTION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 7C.
W79-01989

4B. Groundwater Management

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Sciences, London (England).
For primary bibliographic entry see Field 8B.
W79-01503

EXPERIENCE IN ARTIFICIAL GROUNDWATER RECHARGE FOR WATER SUPPLY IN LITHUANIA,
I. P. Dilyunas.
Soviet Hydrology: Selected Papers, Vol. 15, No. 4, p 340-343, 1976. 3 fig, 5 ref. Translated from Hydraulic Engineering and Reclamation (Gidrotekhnika i melioratsiya), No. 7, p 78-84, 1976.

Descriptors: *Groundwater recharge, *Water supply, *Aquifers, *Artificial recharge, Recharge, Pit recharge, Induced infiltration, Recharge wells, Injection wells, Water reuse, Infiltration rates, Foreign research, Foreign countries, Water quality, Percolation, On-site tests, On-site investigations.

Lithuania has large groundwater resources because of its location in the temperate climatic belt with ample precipitation (500-850 mm/year), its dense drainage network (averaging 0.4 km/sq km), and the widespread occurrence of sandy-gravelly mantle deposits in the Quaternary glacial stratum, which is 100-150 m or more thick. Systematic investigations of groundwater recharge methods for water supply have been conducted since 1965. An alluviall aquifer 9-20 m thick in sandy-gravelly deposits is exploited in the area of the Eygulyays water intake. The groundwaters are recharged artificially from two infiltration basins with infiltration areas of 4,250 and 3,790 sq m at a filling depth of 3.2-3.4 m. Their beds consist of coarse-grained sand underlain by gravelly-pebbly deposits. Infiltration occurs without backwater: the depth from the bottom of the basins to the groundwater remains at 6-6.5 m throughout the infiltration cycle. The percolation rate during the infiltration cycle varies from 2.8 to 0.05 m/day and averages 0.35 m/day. Artificial groundwater recharge is justified in all the cases examined. This is a fairly efficient water supply method under the conditions prevailing in Lithuania, and it should be used to replenish the exploitable groundwater reserves. (Humphreys-ISWS)
W79-01508

SIMULATION OF FLUID-ROCK INTERACTIONS IN A GEOTHERMAL BASIN,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 2F.
W79-01516

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD GROUNDWATER FLOW REGIME,
Atlantic Richfield Hanford Co., Richland, WA.
For primary bibliographic entry see Field 5B.
W79-01522

GEOCHEMISTRY OF GROUND WATER, SOUTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W79-01535

HYDROLOGIC CHARACTERISTICS OF COAL-MINE SPOILS, SOUTHEASTERN MONTANA,
Montana Coll. of Mineral Sciences and Technol-

ogy, Butte.
For primary bibliographic entry see Field 5B.
W79-01542

GEOTHERMAL POWER AND WATER PRODUCTION STUDIES AT THE UNIVERSITY OF CALIFORNIA,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 3E.
W79-01546

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-01735

DOLOMITIZATION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W79-01749

METHOD AND MEANS OF TREATING WATER WELLS,
Moran (Thomas L.), Amarillo, TX. (Assignee).
For primary bibliographic entry see Field 3B.
W79-01871

ARSENIC LEVELS IN THE SURFACE AND GROUND WATERS ALONG WHITEWOOD CREEK, BELLE FOURCHE RIVER, AND A PORTION OF THE CHEYENNE RIVER, SOUTH DAKOTA,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W79-01897

OCCURRENCE OF IRON BACTERIA IN GROUND WATER SUPPLIES OF ALABAMA,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01908

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN TERRY COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01927

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN YOAKUM COUNTY TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01928

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN COCHRAN COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 7C.
W79-01930

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LUBBOCK COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources Austin.
For primary bibliographic entry see Field 7C.
W79-01931

ARTIFICIAL GROUND-WATER RECHARGE AS A WATER-MANAGEMENT TECHNIQUE ON THE SOUTHERN HIGH PLAINS OF TEXAS AND NEW MEXICO,
Texas Dept. of Water Resources, Austin.
R. F. Brown, D. C. Signor, and W. W. Wood.
Report No. 220, August 1978. 32 p, 23 fig, 1 tab, 23 ref.

Descriptors: *Water management(Applied), *Groundwater, *Aquifers, *Water-spreading basins, *Injection wells, *Artificial recharge, *Southwest U.S., *Ogallala Formation, Texas, New Mexico, Southern High Plains(TX, NM), Plains, Irrigation, Lakes, Playas, Permeability, Flocculation, Pumping, Costs, Arid lands, Clays, Dry farming, Reclamation states.

Two methods of artificial groundwater recharge in the Ogallala Formation aquifer in the southern high plains of Texas and New Mexico are described: (1) water-spreading basins, and (2) injection wells. Both systems use water collected in the thousands of playa lakes in the region; this water normally evaporates rapidly (about 12.7 mm/day in summer). Little water moves downward from the playas due to clay-sealed central basins. The Ogallala aquifer receives less than two mm water/year under present climatic conditions, but an average of 305 mm are withdrawn annually. Most irrigated farms in the central and southern parts of the southern high plains will becme dryland farms before the year 2000 at the current rate of water use. Field tests and laboratory research indicate that spreading basins are the most economical approach to recharge in most areas, but where surficial materials have low vertical permeability, injection wells offer a viable alternative. Both systems: (1) pump water from the playa lakes, preferably from near the surface to reduce sediment load; (2) treat the water with a flocculant to speed settling of sediment; and (3) hold the water in a settling basin for sedimentation. With spreading basins, the clarified water is pumped into the basins, located in an area with highly permeable sediments (greater than 0.3 m/day surface, 0.06 m/day below). In areas with impermeable sediments, water is pumped into the aquifer by way of injection wells. (Lynch-Wisconsin)
W79-01992

4C. Effects On Water Of Man's Non-Water Activities

ECOLOGICAL RECOVERY OF REALIGNED STREAM CHANNELS,
Federal Highway Administration, Portland, OR.
For primary bibliographic entry see Field 6G.
W79-01515

EFFECTS OF CONSTRUCTION OF LIBERTY STATE PARK ON HYDRAULIC CHARACTERISTICS OF NEW YORK HARBOR; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W79-01518

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01543

SOLAR RADIATION AND URBAN HEAT ISLANDS,
California Univ., Los Angeles. Dept. of Geography.
For primary bibliographic entry see Field 2B.
W79-01568

WETLANDS OF THE UNITED STATES: THEIR EXTENT AND THEIR VALUE TO WATERFOWL AND OTHER WILDLIFE,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
For primary bibliographic entry see Field 6B.
W79-01635

LOUISIANA METROPOLITAN WETLANDS: A PLANNING PERSPECTIVE, A REPORT TO THE LOUISIANA STATE PLANNING OFFICE,
New Orleans Univ., LA. Urban Studies Inst.
For primary bibliographic entry see Field 6B.
W79-01650

INLAND LAND USE ACTIVITIES AND GEORGIA'S COASTAL WATERS,
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 944, Price codes: A11 in paper copy, A01 in microfiche. October 1976. 17 fig, 1 tab, 106 ref.

Descriptors: *Georgia, *Coasts, *Land management, Wetlands, Inland waterways, Coastal marshes, Land use, Estuaries, Coastal waterways.

Information has been assembled related to the impact of inland land use activities on Georgia's coastal waters, including marshes and estuaries. Natural resource processes which affect the impact of inland activities, such as flows of water, sediments, and nutrients, are described. In addition, available information describing impacts from forestry, agriculture, urbanization, and large-scale public works projects are included. Although the report does not contain policy recommendations, this background information is useful for developing coastal zone management program goals and objectives. (Steiner-Mass)
W79-01651

PREDICTION OF FLOW HYDRAULICS FOR VEGETATED CHANNELS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01726

SEEDLING EMERGENCE AS RELATED TO TEMPERATURE AND MOISTURE TENSION,
Florida Univ., Quincy. Dept. of Agronomy.
For primary bibliographic entry see Field 4D.
W79-01751

HARRY'S BROOK - A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01907

CONTEMPORARY AND HISTORICAL TRACE METAL LOADINGS TO THE SEDIMENTS OF FOUR LAKES OF THE LAKE WASHINGTON DRAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01985

4D. Watershed Protection

SEDIMENT CONTROL CONFERENCE, HELD AT HELENA MONTANA ON DECEMBER 15, 1972.
National Association of Conservation Districts, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 236, Price codes: A04 in paper copy, A01 in microfiche. December 1972. 63 p. EPA-68-010-0704.

Descriptors: *Sediment control, *Erosion control, *Conferences, Sediments, State governments, Federal government, Legal aspects, Legislation, Organizations, Soil conservation.

The objective of this Conference was to help bring about recognition of a growing state and national concern about erosion prevention and sediment control, awareness of existing and proposed actions in this field by state and federal governments, consideration of the physical and organizational aspects of sediment control, consideration of the model legislation prepared under the auspices of the Council of State Governments, and development of a plan of action for sediment control by responsible leaders in Montana. (Humphreys-ISWS)
W79-01523

APPLICATION OF LANDSAT IMAGE WETLAND STUDY AND LAND CLASSIFICATION IN WEST TENNESSEE,
Tennessee University Space Inst. Tullahoma. Remote Sensing Div.
For primary bibliographic entry see Field 7B.
W79-01638

THE VERIFICATION OF LANDSAT DATA IN THE GEOGRAPHICAL ANALYSIS OF WETLANDS IN WEST TENNESSEE,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 7B.
W79-01639

SEEDLING EMERGENCE AS RELATED TO TEMPERATURE AND MOISTURE TENSION,
Florida Univ., Quincy. Dept. of Agronomy.
D. L. Wright, R. E. Blaser, and J. M. Woodruff.
Agronomy Journal, Vol. 70, No. 5, p 709-712, September-October, 1978. 1 fig, 1 tab, 16 ref.

Descriptors: Erosion control, *Grasses, Legumes, Highway beautification, *Germination, *Seeds, *Moisture tension, *Temperature.

To aid in selection of species for mixtures of seed for controlling erosion on newly constructed highway slopes, an experiment was designed to determine total emergence and rates of emergence of several grass and legume species and cultivars under various soil moisture and temperature regimes. The experimental observation suggested that the aggressive species of annual and perennial ryegrass, German millet, redtop, weeping lovegrass, and Abruzzi rye compete strongly with slower developing perennial grasses and legumes when seeded in the appropriate season. It was also observed that successful establishment of the intermediate species such as bluegrass, crownvetch, creeping red fescue, and Kentucky 31 tall fescue depends on cool temperatures and high moisture availability. Nonaggressive species of crownvetch and sericea also required high moisture and cool temperature, whereas common bermudagrass needed high moisture and warm temperatures. It was concluded that modification of seed mixtures should depend on the season of seeding and the type of vegetation desired, and that lower rates of aggressive species should be used while seeding mixtures of agressive species should be used while seeding mixtures of aggressive species with slow-developing species when conditions favor rapid emergence and growth for both. (Skogerboe-Colorado State)
W79-01751

HYDROLOGIC INTERPRETATION OF BASIN MORPHOLOGY,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 2A.
W79-01899

FLUVIAL ADJUSTMENTS TO THE SPREAD OF TAMARISK IN THE COLORADO PLATEAU REGION,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 2J.
W79-01919

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

PROBLEMS IN AUTOMATING THE MONITORING OF SURFACE WATER CHEMISTRY,
Hydrochemical Inst., Novocherkassk (USSR).
V. B. Stradomskiy.
Soviet Hydrology: Selected Papers, Vol 15, No 4, p 288-299, 1976. 6 fig, 6 tab, 29 ref. Translated from Gidrokhimicheskiye Materialy, Vol 63, p 3-21, 1976.

Descriptors: *Water chemistry, *Surface waters, *Automation, *Instrumentation, Water pollution, Pollutants, Water temperature, Dissolved oxygen, Hydrogen ion concentration, Suspended solids, Chemicals, Water quality, Rivers, Monitoring, Surveys, *USSR.

Modern equipment for determining the physical properties and chemical characteristics of water permits partial automation. In the future, most of the important characteristics that control surface water quality will be determined automatically using improved automation equipment and high-efficiency instruments, making it possible to measure the necessary water consumption characteristics directly in situ at the necessary point of a body of water. Automation of water quality monitoring involves the solution of at least three independent, but very closely related, problems: (1) the design principles of water quality monitoring and control systems; (2) instrumental methods and instruments for automated monitoring; and (3) mathematical base of the system (including cybernetic and physical simulation). An automated system would provide continuous monitoring of the chemical composition of surface water that varies rapidly in time and space on a new qualitative level, allowing water conservation planning. (Sims-ISWS)
W79-01507

MAJOR ELEMENT GEOCHEMISTRY OF LAKE POWELL,
Dartmouth Coll., Hanover, NH. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W79-01511

PART I: APPLICATION OF PULSE POLAROGRAPHY AND PULSE ANODIC STRIPPING TO THE DETERMINATION OF SELECTED HEAVY METALS IN NATURAL WATERS--PART II: APPLICATION OF CONTROLLED POTENTIAL COULOMETRIC TECHNIQUES TO THE DETERMINATION OF URANIUM,
Tennessee Univ., Knoxville.
S. T. Crosmun.
Available from the National Technical Information Service, Springfield, VA 22161 as TID-27709, Price codes: A06 in paper copy, A01 in microfiche. Ph D Dissertation, June 1977. 115 p 12 fig, 9 tab, 88 ref, 4 append.

Descriptors: *Polarographic analysis, *Heavy metals, *Water analysis, *Analytical techniques, *Trace elements, Instrumentation, Chemical analysis, Testing procedures, Cadmium, Toxicity, Lead, Pollutants, Zinc, Chromium, Water pollution, Analysis, *Pulse polarography, *Pulse anodic stripping, *Coulometric techniques, Uranium, Micro-analysis, Electrochemistry.

The use of a thin mercury film wax-impregnated graphite electrode for the simultaneous determination of cadium, lead, and zinc in an acetate buffer by differential pulse anodic stripping voltammetry was described. Optimal instrumental parameters for maximum resolution and sensitivity for simultaneous analysis of these three elements in natural waters were discussed. The interference of copper with the determination of zinc was investigated in detail. An optimal mercury film thickness for this electrode was suggested. A method utilizing differential pulse polarography for the determination of chromium (VI) in natural water was described. Additions of 0.62 micrograms Cu(II)/ml and 0.55 micrograms Fe(III)/ml did not interfere with the determination of 0.050 micrograms Cr(VI)/ml. The natural water samples containing Cr(VI) were buffered to approximately pH 7 with 0.1 M ammonium acetate and 0.005 M ethlenediamine and analyzed. Natural water samples of chromium from 0.035 microgrms to 2.0 micrograms/ml may be analyzed directly without further preparation. The detection limit is 0.010 micrograms/ml. A novel, highly efficient cell with integral stirrer for controlled potential coulometry was described. This cell was used to demonstrate the feasibility of determining uranium (VI by predictive coulometry. A PDP 8/I minicomputer was used to predict the coulometric endpoint with high accuracy within 2.5 minutes in a titration which normally takes about 10 minutes. This technique was shown to yield acceptable results even in the presence of an interfering phosphate matrix. (Henley-ISWS)
W79-01517

MYCOFLORA OF ACTIVATED SEWAGE SLUDGE,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5E.
W79-01548

EXCHANGE OF CARBON DIOXIDE BETWEEN THE ATMOSPHERE AND LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2K.
W79-01550

BIOLOGICAL ASSESSMENT OF WATER QUALITY IN A LARGE RIVER SYSTEM: AN EVALUATION OF A METHOD FOR FISHES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
C. H. Hocutt, R. L. Kaesler, M. T. Masnik, and J. Cairn, Jr.
In: European Inland Fisheries Advisory Commission, Symposium on Methodology for the Survey, Monitoring and Appraisal of Fishery Resources in Lakes and Large Rivers. Symposium 55, March 1974. 20 p, 5 tab, 8 fig.

Descriptors: *Bioindicators, *Statistical methods, *Analytical techniques, *Stress, *Water quality control, *Biological communities, Mathematic studies, Water quality, Fish, Fresh water, *Jaccard similarity coefficient, *Diversity index, Biological assessment, Synthetic fibers, Virginia.

Fish have certain disadvantages and indicators of stress conditions in aquatic systems. They are mobile and can migrate to and from stressed areas at will if not so drastically affected that movement is curtailed. Furthermore, data gathering may be highly qualitative and not easily interpreted. The public, however, more often focuses its attention on fish than other aquatic organisms and is not fully satisfied about the health of an aquatic system unless fish information is available. This study provides data on fish collected during the summers 1971 and 1972 from the New River is the vicinity of a synthetic fibers plat, Pearisburg, Virginia. These data were analyzed by two methods and

constrasted: the diversity index of Wilhm and Dorris and the Jaccard similarity coefficient. The former is a method currently used in monitoring aquatic ecosystems and is a function of the numbers and kinds of species found. The latter analyzes only presence or absence of data at each station, and provides a more critical method of analyzing data. The Jaccard similarity coefficient is recommended as a method for the biological assessment of water quality. (EIS-Katz)
W79-01553

POSSIBLE CHANGES IN AEROSOL COMPOSITION DUE TO DEPARTURE FROM EQUILIBRIUM CONDITIONS DURING SAMPLING,
Swedish Water and Air Pollution Research Lab., Goteborg.
C. Brosset.
Publication No. B 454, July 1978. 28 p, 4 fig, 7 tab, 4 ref.

Descriptors: *Sampling, *Aerosols, *Equilibrium, *Particle size, *Particulates, *Path of pollutants, *Gases, *Air pollution, Fallout, Solubility, Methodology, Analytical techniques, Liquids, Pressure, Equations, Acids, Volatility, Chemistry, Ammonia, Nitric acid, Hydrogen chloride, Water, Ammonium, Ions.

Simple equations are presented which express the relationship at equilibrium between the partial pressures of gaseous components (water, nitric acid, hydrogen chloride, and ammonia) and the respective ion concentrations in the liquid phase (sulfate, nitrate, chlorine, ammonium, and hydrogen). These equations can be used to show changes that may occur in the aerosol composition when such a system is exposed to certain disturbances in connection with particle sampling. All calculations showed that departure from equilibrium causes the release of volatile components and transformation from the liquid phase to the gas phase. In some cases sampling total suspended matter and analyzing the gas passing through a filter is advantageous. Chemical properties of particles differ in relationship to the two main classes of size fractions, fine and coarse. Two such particle populations were assumed to be in equilibrium with the gas phase, then effects of changes in sampling were investigated. Changes assessed were: (1) reduction in ammonia concentration, and (2) reduction in concentrations of acid gases (nitric acid and hydrogen chloride). Effects of changes in the water content of the system were analyzed, such as heating the filter to keep particle samples dry, which resulted in a considerable percentage loss of nitric acid and hydrogen chloride in fine particles and hydrogen ion and ammonium in coarse particles. (Lynch-Wisconsin)
W79-01554

VIRUSES IN FINISHED WATER: THE OCCOQUAN EXPERIENCE,
Health Effects Research Lab., Cincinnati, OH.
E. W. Akin, and W. Jakubowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 316, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/J-76-044, 1976. In: Proceedings AWWA Water Quality Technology Conference, San Diego, California, December 5-8, 1976. p. 1-10, 5 tab, 8 ref.

Descriptors: *Viruses, *Water pollution, *Public health, *Water supply, Disinfection, Environmental sanitation, Water pollution control, Evaluation, Water pollution sources, Investigations, Occoquan, Laboratory tests, Water sampling, Quality control.

An investigation was carried out following reports of detection of live poliovirus 1 in four samples of finished water collected from the Occoquan, Virginia, reservoir system. An evaluation of the collection sites and other bacteriological data relating to the reportedly contaminated samples indicated that the reservoir is an unlikely source of virus pollution. Some of the reasons for this conclusion are that chlorine concentration and pH levels at the time were what is generally considered excellent for virus disinfection. Also, counts of cliform bacteria and other viruses were extremely low, indicating that the water was not heavily polluted with domestic waste. In addition, further studies on Occoquan water failed to detect a single virus. It is concluded that under the circumstances the detected viruses may be the result of exogenous contamination, such as laboratory handling. Some other occurrences of this type are described and the necessity for maintaining stringent laboratory procedures for preventing contamination is stressed. One source described is insufficient cleaning of laboratory apparatus after testing recovery systems using a seed virus. It is recommended that some kind of marker be included in the seed which is not present in naturally occuring virus. (Majtenyi-IPA)
W79-01577

DEVELOPMENT OF TECHNIQUE FOR DETECTION OF LOW MOLECULAR WEIGHT CONTAMINANT IN PRODUCT WATER FROM WATER PURIFICATION OR WATER REUSE SYSTEMS,
Amicon Corp., Lexington, MA.
T. W. Mix, and H. Scharen.
Available from the National Technical Information Service, Springfield, VA as ADA-038 148, Price codes: A05 in paper copy, A01 in microfiche. Final Comprehensive Report, August 1976. 88 p, 28 fig, 10 tab, 14 ref. DADA17-72-C-2169.

Descriptors: *Waste water treatment, *Monitoring, Colorimetry, *Water reuse, *Water purification, Reverse osmosis, Ozone, Permanganate, Spectrophotometry, Organic chemicals, Aldehydes, Water quality control, Technology.

A permanganate colorimeter was developed for detection of low molecular weight contaminants in waste water produced from water purification or water reuse systems. Main emphasis centered on monitoring quality of MUST product water which was processed through both reverse osmosis and ozonation. A permanganate colorimeter was selected for the following reasons: (1) the rate limiting step in ozonation of MUST reverse osmosis permeate appears to be ozonation of aldehydes, especially actaldehyde, which accumulate and represent and appreciable fraction of total organic carbon in the product water; (2) aldehydes are rapidly oxidized by basic permanganate solutions; (3) permanganate and manganate ions have high extinction coefficients and are rapidly detectable spectrophotometrically in low concentration; and (4) colorimetry is compatible with requirements for low cost, simplicty, reliability, durability, and portability. Also described are: a preliminary investigation of a spectrophotometer technique for the monitoring rate of decay of ozone as a measure of water purity; carbon adsorption experiments related to monitoring carbon column adsorption; and a preliminary study of monitoring combined reverse osmosis and ozonation as tertiary treatment for municipal treatment plant output. (Majtensyi-IPA)
W79-01578

MEASUREMENT OF TOTAL ORGANIC CONCENTRATION IN WATER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
E. Winkler.
NASA (National Aeronautics and Space Administration) TechBriefs, Vol. 3, No. 1, p 55, Spring, 1978. 2 fig.

Descriptors: *Water analysis, *Organic compounds, *Carbon, Wastes, Water pollution sources, Water pollution, Instrumentation, Ultraviolet radiation, Oxygen, Electrolysis, Water, Analytical techniques, Laboratory equipment, *Pollutant identification.

In a new continuous single-step process and instrument for determining the total organic carbon in water or waste water, the organic compounds, are oxidized to carbon dioxide by UV photolysis. The only required reagent, oxygen, is generated in situ by electrolysis of water. The apparatus is described and illustrated. (Brown-IPC)
W79-01600

PRELIMINARY EVALUATION OF THE WATER QUALITY OF PROPOSED TOWANDA LAKE, KANSAS.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A057 074, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper Y-78-3, June 1978. 42 p, 10 tab, 1 append, 6 ref. Prepared in Environmental Laboratory, USAEWES.

Descriptors: *Water quality, *Evaluation, *Water analysis, *Kansas, Reservoirs, *Whitewater River(Kan), *Towanda Lake(Kan).

Investigated possible water-quality problems that may affect the realization of project benefits of proposed Towanda Lake--particularly the effects of total dissolved solids (TDS), chloride, and sulfate concentrations on water supply suitability. Because of high concentrations of these parameters, possible treatment processes were evaluated to alleviate potential water supply problems. The proposed impoundment would probably be well mixed, exhibiting weak, ephemeral stratification only during periods of calm weather. Therefore, a mass-balance routing of TDS, sulfates, and chlorides through the pool was performed. Results of the mass-balance routing indicated only minor problems should be expected with TDS levels and chloride and sulfate levels should remain below U.S. Environmental Protection Agency (EPA) criteria for these parameters. On the basis of this analysis, no special considerations in water treatment design are considered necessary for these parameters. Occasional algal blooms should be expected during periods of calm weather and this should be considered in the design of the water supply withdrawal system. Levels of fecal coliform bacteria in the headwaters of the reservoir should be expected to exceed EPA criteria following storm events, which may preclude the use of portions of the reservoir for primary contact recreation. (WES)
W79-01666

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Inst., MA.
For primary bibliographic entry see Field 5C.
W79-01691

IMPROVED TECHNIQUES FOR MARKING AND SAMPLING BAND-APPLIED FERTILIZERS AND PESTICIDES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
L. L. Hendrickson, D. R. Keeney, D. B. Lesczynski, and L. M. Walsh.
Soil Science Society of America Journal, Vol. 42, No. 3, p 507-508, May-June, 1978. 1 fig, 1 tab, 10 ref.

Descriptors: Nitrification, Inhibitors, *Sampling, *Marking, Nitrogen compounds, *Fertilizers, *Pesticides.

Techniques for marking and sampling banded fertilizers were developed to estimate the rate of nitrification and the recovery of N from the band treated with a nitrification inhibitor. The band was marked by applying prilled elemental S at the point of fertilizer release. With this approach the band was easily detected many months after fertilizer application. The sampler was constructed of stainless steel and was 15 by 15 by 40 cm long. It was inserted into the soil above the previously located band and then removed and disassembled, and the soil subsectioned for a vertical profile of constituents in the band. The expanded dimensions of the sampler reduced sample variability, yet still allowed sufficient sampling efficiency to obtain adequate replication. These techniques provided more accurate estimates of nitrification and recovery of applied N and should find application in monitoring other fertilizers or pesticides on easily penetrated soils devoid of rocks. (Skogerboe-Colorado State)

W79-01709

DETERMINATION OF STABILITY CONSTANTS OF METAL-HUMIC ACID COMPLEXES BY POTENTIOMETRIC TITRATION AND ION-SELECTIVE ELECTRODES,
National Inst. for Environmental Studies, Yatabe (Japan). Water and Soil Environment Div.
T. Takamatsu, and T. Yoshida.
Soil Science, Vol. 125, No. 6, p 377-386, June, 1978. 8 fig, 4 tab, 19 ref, 14 equ.

Descriptors: *Heavy metals, *Humic acids, Electrodes, Pollutants, Copper, Cadmium, Lead, *Volumetric analysis.

A new technique based on the combined use of potentiometric titration and ion-selective electrodes was proposed for determining apparent stability constants (successive stability constants and overall stability constants) of divalent metal cation (Cu(++), Pb(++), and Cd(++) complexes with humic acids. Fourteen humic acids from diverse sources, including humidified rice straw, were examined. The stability constants increased with an increase in pH, and the order of values obtained was Cu(++) > Pb(++) >> Cd(++). The overall logarithmic stability constants with the soil humic acid examined were 8.65 for Cu(++), 8.35 for Pb(++), and 6.25 for Cd(++) at pH 5.0. The overall stability constants of Cd(++) complexes ranged from 430000 to 4.6 times 10 to the 7th power at pH 6.0. The overall stability constants increased with increasing humification in the higher humification range, and the values correspond to the contents of very weakly acidic functional groups. The binding mechanisms of the metal cation complexes with humic acids seemed to accompany the coordinate bonds of undissociated very weakly acidic functional groups, in addition to the ionic bonds through COOH and/or OH groups. (Skogerboe-Colorado State)
W79-01721

STUDY OF WATER TREATMENT EFFECTS ON ORGANIC VOLATILES IN DRINKING WATER,
Alabama Univ., University. Dept. of Chemistry.
For primary bibliographic entry see Field 5F.
W79-01722

METHOD FOR ADENOSINE 5'-TRIPHOSPHATE MEASUREMENT ON COKE WASTE ACTIVATED SLUDGE,
Alabama Univ. in Birmingham, Dept. of Biology.
For primary bibliographic entry see Field 5D.
W79-01723

PATTERN RECOGNITION TECHNIQUES APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
Y. T. Chien, and T. J. Killeen.
In: Workshop on Pattern Recognition Applied to Oil Identification, November 11-12, 1976, Coronado, California, Institute of Electrical and Electronics Engineers Computer Society, IEEE Cat. No. 76CH1247-6C, p. 15-33. 12 fig, 14 ref. OWRT A-060-CONN(4), 14-31-0001-6007.

Descriptors: *Oil spills, *Computer programs, *Pollutant identification, Wate quality control, Waste identification, Oil pollution, Oil wastes, *Interactive computer systems, *Patterns recognition, *Pictorial information processor, Discrete waveforms, Thin-layer chromatography.

A brief review of pattern recognition technology as applied to oil spill identification is presented in this paper. Two computer-based systems that are potentially useful for oil spill identification are described. The first is an interactive graphics system which is most suitable for manipulating discrete wave-forms (such as FL or IR Spectra), with the aid of graphical display. The other system is a general 2-dimensional pictorial information processor, which is potentially useful for identifying oil images such as those produced by the TLC technique.
W79-01747

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS - OR DID THE REAL SPILLER GET AWAY.,
Connecticut Univ., Storrs. Dept. of Statistics.
T. J. Killeen, and Y. T. Chien.
In: Workshop on Pattern Recognition Applied to Oil Identification, November 11-12, 1976, Coronado, California, Institute of Electrical and Electronics Engineers Computer Society, IEEE Cat. No. 76CH1247-6C, p. 66-72. 1 fig, 2 tab, 2 ref. OWRT A-060-CONN(3), 14-31-0001-6007.

Descriptors: *Oil spills, *Pollutant identification, *Water pollution sources, *Mathematical models, Model studies, Waste identification, Oil pollution, Oil wastes, *Probability model, *Chemical spectra, Weathering effects.

Severa techniques are used to 'fingerprint' oil by means of chemical spectra. Spectral changes which occur due to weathering are difficult to predict and may invalidate the results. Accurate simulation of weathering conditions is not possible, and weathering changes may be drastically different even for similar oils. Identification of the true spiller through visual examination of spectra is therefore not guaranteed even when all suspects and spill areas have been adequately sampled. A method of revising the probability of the guilt of suspects in an oil spill case has been developed. This technique utilizes the information contained in spectra obtained from suspects and spill samples. It also considers the possibility that the true spiller escaped without being sampled.
W79-01748

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON CADMIUM,
National Environmental Research Center, Research Triangle Park, NC.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-246 820, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Star Series, EPA-600/6-75-003, 72 p, March 1975. 5 fig, 27 tab, 78 ref.

Descriptors: *Cadmium, *Toxicity, Public health, Human pathology, Path of pollutants, Metals, Chemical analysis, Water analysis, Water quality, Chemical properties, Environmental effects, Air pollution, Animal pathology, *Bioaccumulation, *Tissue analysis, *Carcinogens.

This report is a review and evaluation of the current knowledge of cadmium in the ienvironment as related to possible deleterious effects on human health and welfare. Sources, distribution, measurement, and control technology are also considered. Cadmium is widely distributed in the environment. The human body burden of cadmium is cumulative. The half-time of cadmium in man is estimated at over 10 years. Man's primary exposure is from food, tobacco smoke, water, and ambient air. Food and tobacco smoke are the major sources except in the immediate vicinity of major sources of atmospheric emissions of cadmium. Emphysema and other lung diseases have been related to industrial exposure to airborne cadmium compounds. Kidney damage has also resulted from long-term exposure to cadmium. Animal experiments link anemia, hypertension, testicular necrosis, and carcinogesis with cadmium exposure. Current knowledge of the dose-response relationship does not provide criteria on which to base standards. (EIS-Deal)
W79-01756

DETERMINATION OF POLYCHLORINATED BIPHENYLS IN PAPER MILL EFFLUENTS - THE INFLUENCE OF SUSPENDED SOLIDS,
Institute of Paper Chemistry, Appleton, WI.
D. B. Easty, and B. A. Wabers.
Tappi, Vol. 61, No. 10, p 71-74, October, 1978. 8 tab, 6 ref.

Descriptors: *Pulp wastes, *Aroclors, *Polychlorinated biphenyls, *Industrial wastes, *Analytical techniques, Solvent extractions, Surfactants, Fibers(Plant), Gas chromatography, Pollutant identification, Effluents, Water analysis, Chemical wastes, Waste water disposal.

Aroclor 1242, a toxic mixture of polychlorinated biphenyls (PCB) previously used in carbonless copy paper, is still apparent in pulp mill products, effluents, and sludges because of the use of recycled fiber. Studies were performed to evaluate the EPA'S methodology for analyzing PCB's in paper mill effluents and process streams containing suspended solids. Chemical analyses involved liquid-liquid extraction, Florisil cleanup, and electron gas capture chromatograpy. The evaluatio focused on the retention of PCB's by hardwood and softwood fiber suspensions during separatory funnel extraction. The studies demonstrated that a two-step procedure was required for complete removal of Aroclor 1242 from suspensions of Cellulose fibers. The recommended procedure incorporated triple separatory funnel extraction followed by alcoholic KOH reflux of the isolated fibers. The EPA procedure was concluded to be adequate for mill effluents containing low amounts of suspended solids. The alcoholic KOH reflux stage was considered necessary to counteract that PCB sorption which was controlled by the fiber-specific surface area and resin content of the fiber suspensions. The presence of starches and pigments, with the possible exception of clay and talc, did not interfere with the two-step extraction procedure. (Schulz-FIRL)
W79-01771

SHORT-TERM VARIATION OF THE CHEMICAL COMPOSITION OF THE NIAGARA RIVER,
Department of the Environmental, Burlington (Ontario). Water Quality Div.
C. H. Chan, and A. H. Clignett.
Fisheries and Environment Canada, Scientific Series No. 90, 1978, 35 p, 13 tab, 9 fig, 2 append.

Descriptors: *Water quality control, *Water quality, *Statistical methods, Water pollution, Pollutant identification, Water pollution sources, Phosphorus, Nitrogen, Nutrients, Ions, Chemical reactions, Ammonia, Chloride, Time series analysis, *Lake Ontario, *Niagara River, Pollution levels.

This report lists results of a daily sampling program at Niagra-on-the-Lake to obtain refined loading estimates of phosphorus, nitrogen and major ions into Lake Ontario from the Niagara River. The accuracy of the daily data within a week is measured against data collected at hourly intervals. Samples were collected from an automatic water sampler. Four 7-day periods for each season were chosen to evaluate the variabilities in water quality. Summary statistical tables of hourly samples for nutrients and major ions for the 4 time periods are presented. Results show a significant and large seasonal variation in the chemical composition of the water. Charts showing a power spectral analysis on cyclic behavior in nutrient variables are presented. No significant diurnal variations were detected. Tables are included of daily mean concentrations of nutrients and major ions and the expected deviations from these mean concentrations. With the exception of ammonia, the concentration frequency distribution of each parameter measured within a week assumes a normal distribution. Thus, fewer water samples would give comparable results without losing too much accuracy, saving time and money. (Coan-NC)
W79-01831

APPARATUS FOR THE CONTINUOUS MEASUREMENT OF THE CONCENTRATION OF OIL,
Horiba, Ltd., Kyoto (Japan). (Assignee).
M. Iwamoto, and T. Nomura.
U.S. Patent No. 4,103,162, 7 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1722, July 25, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, Water pollution sources, Analytical techniques, *Pollutant identification, Infra-red absorption techniques.

An apparatus for continuously measuring the concentration of oil in a water sample by the infra-red absorption method is described. The measuring response of the apparatus is rapid as opposed to previous devices and the accuracy in measuring the oil content is sufficiently accurate. The apparatus comprises a supply device which supplies an oil-containing water sample and another supplying device which supplies a solvent for extracting the oil in the sample in a controlled and continuous amount. An extractor connected to the supplying device has an agitator and receives the oil-containing water sample and solvent and serves to extract the oil component in the water sample with the solvent. (Sinha-OEIS)
W79-01867

ARSENIC LEVELS IN THE SURFACE AND GROUND WATERS ALONG WHITEWOOD CREEK, BELLE FOURCHE RIVER, AND A PORTION OF THE CHEYENNE RIVER, SOUTH DAKOTA,
Geological Survey, Vermillion, SD.
R. L. Stach, R. N. Helgerson, R. F. Bretz, M. J. Tipton, and D. R. Beissel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 374, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Institute, South Dakota State University, Brookings, Completion Report. July 1978. 42 p, 12 fig, 11 tab, 15 ref. OWRT A-054-SDAK(1), 14-34-0001-6043.

Descriptors: Observation wells, Recharge, Mine tailings, *Selenium, Pierre shale, *South Dakota, *Arsenic, Surface water, Groundwater, Whitewood Creek(SD), Belle Fourche River(SD), Cheyenne River(SD), Trace elements, *Pollutant identification, Water analysis.

As a result of 100 years of gold mining activity in the northern Black Hills, the waters of Whitewood Creek, Belle Fourche River, and Cheyenne River have anomalous trace element contents. The emphasis of this study was analysis of the arsenic content of ground and surface waters; selected samples were analyzed for selenium. A total of 81 ground-water sampling sites were established; of these, 39 were installed plastic-cased observation wells with the remainder private wells. The arsenic content of 243 samples range from less than 2.5 parts per billion (ppb) to 2000 ppb. Of the 81 sampling sites, water from 14 sites exceeded the drinking water standard of 50 ppb one or more times. Twelve of these sites were located along Whitewood Creek, one along the Belle Fourche River and one along the Cheyenne River. The high arsenic level found in the ground water along Whitewood Creek is thought to result from direct recharge by the creek and/or bacterial oxidation and leaching of the mine tailings deposited on the floodplain. Which mechanism or combination prevails is dependent on the specific site. Selenium analyses were performed on 64 samples. The range was from 0.0 ppb to 3.0 ppb with 12 of the samples exceeding the drinking water standard of 10 ppb. The high selenium values were associated with water wells developed in or near the Pierre shale. The natural background source of the selenium is the shale. (Wiersma-South Dakota)
W79-01897

HARRY'S BROOK - A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01907

DEVELOPMENT OF A NEW TECHNIQUE FOR THE ANALYSIS OF PESTICIDES IN WATER,
Kentucky Water Resources Research, Inst., Lexington.
P. K. Kadaba, P. K. Bhagat, R. Osredkar, and V. R. K. Murthy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 370, Price codes: A04 in paper copy, A01 in microfiche. Research Report No 116, 1978. 59 p, 20 fig, 2 tab, 19 ref. OWRT A-065-KY(1). 14-34-0001-6018. 14-34-0001-7037.

Descriptors: *Spectroscopy, Spectrometers, *Trace elements, Pesticides, Organic compounds, Carbamate pesticides, *Pollutant identification, Analytical techniques, Water analysis, *Pesticide residues, *Spectrophotometry, Nuclear Double Resonance Spectrograph, Electronic structure of molecules, Molecular structure.

A Nuclear Double Resonance Spectrograph has been designed and constructed with emphasis on quadrupolar nuclei of half-integral spins. The use of a data acquisition and processing system featuring the A/D converter, signal averager with built in fast Fourier transformation hardware greatly improves the S/N ratio. The spectrograph has been used to detect certain organochlorine, carbamate and symmetrical triazine pesticides. Concentration levels that can be detected range from 15 to 100 micrograms per liter. Since the measurements are done below ice temperatures, heat-liable compounds can be detected without conversion to more suitable derivatives as in gas chromatography. Fats and oils in sample extracts do not interfere with the measurements. Further improvement in sensitivity is possible by using liquid nitrogen-cooled, ferrite-cored electromagnet, by increasing the polarizing field and by reducing receiver recovery time. In addition to analysis of pesticides, the Nuclear Double Resonance technique can be used to study the electronic structure of molecules.
W79-01981

CONTEMPORARY AND HISTORICAL TRACE METAL LOADINGS TO THE SEDIMENTS OF FOUR LAKES OF THE LAKE WASHINGTON DRAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01985

MEASUREMENTS OF PHYTOPLANKTON-PROTEIN CONTENT WITH THE HEATED BIURET-FOLIN ASSAY,
USV Pharmaceutical Corp., Tuckahoe, NY.
T. E. Dorsey, P. McDonald, and O. A. Roels.
Journal of Phycology, Vol. 14, No. 2, p 167-171, 1978. 3 fig, 2 tab, 19 ref. Sea Grant 04-5-158-59.

Descriptors: *Proteins, *Phytoplankton, *Heated biuret-folin method, *Plant growth, *Assay, *Measurement, Algae, Methodology, Analytical techniques, Spectrophotometry, Indicators, Filtration, Nitrogen, Particulates, *Bioassay.

The heated biuret-folin protein assay is shown to be applicable to assays of algal protein in several freshwater and marine phytoplankton species, and is considered a good quantitative measure of algal growth. In this method, a filter containing the algal sample is placed in the bottom of a test tube, 5 ml biuret reagent added (slightly modified to accomodate additional chelating agent), and the contents heated at 100C for 100 minutes before addition of Folin-phenol. The tube is then centrifuged to remove the filter, and the molybdate blue clor measured with a spectrophotometer at 660 nm and compared with identically treated standards. This method consistently measures 90% of the total nitrogen of filtered algal samples as protein-nitrogen without the need of mechanical disruption; data indicate the method measured total protein on all species tested and for naturally occurring mixtures of algae and detritus. Dilute algal suspensions with as little as 0.05 microgram-atom particulate protein-nitrogen/liter can be concentrated by filtration on glass fiber filters to the optimum 1.0 microgram-atom particulate protein-nitrogen per filter. Other assays of algal protein content, including those of Price and of Packard and Dortch, are unsatisfactory for algal species which are difficult to break. Current methods of growth measurement lack the rigid quantification of this method, which is both quantitative and chemically specific. (Lynch-Wisconsin)
W79-01995

5B. Sources Of Pollution

APPLICATION IN THE WATER INDUSTRY OF REGIONAL GEOCHEMICAL MAPS OF ENGLAND AND WALES,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
I. Thornton, and J. S. Webb.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 1, p 11-25, January 1977. 6 fig, 4 tab, 26 ref.

Descriptors: *Water pollution sources, *Water quality, *Sediments, *Surveys, Metals, Streambeds, Geochemistry, Estuaries, Water pollution, Lead, Maps, Data collections, Areal, Cadmium, Spatial distribution, Arsenic, Copper, Zinc, Streams, Rivers, Foreign countries, *England, *Wales.

Regional geochemical maps of England and Wales have focussed attention on a number of metal-rich areas related to contamination from past base-metal mining and smelting, present-day industrial activity, urbanization, and natural geochemically-anomalous source rocks. Detailed sampling in the soft water environment of southwest England demonstrated an encouraging degree of correlation between metals in sediments and waters and served to confirm the thesis that a knowledge of the chemical composition of stream sediment can prove useful in the prediction of sites where, under certain conditions of rainfall and runoff, the metal load in associated waters may exceed recommended limits. Thus, in certain cases, the sediment may prove a more stable indication of potential metal excess than one-off sampling of the waters themselves. If this is widely true, the geochemical atlas of England and Wales, based on the multi-element analysis of tributary drainage sediments, may be applied usefully by the Water Industry to assist in the selection of key sites for water monitoring programs to help identify those trace elements or metals that require monitoring. The regional geochemical maps constitute a unique source of baseline data, which, it is hoped, will assist in present-day and future assessment of water resources. The atlas has drawn attention to several estuaries where contaminated input drainage has led to a marked enhancement of metals in sediments and waters, which in turn can affect the potential use of estuaries and their waters for shellfish culture. (Humphreys-ISWS)
W79-01501

THE 1976 DROUGHT AND NITRATE LEVELS IN THE RIVER EXE BASIN,
Exeter Univ. (England). Dept. of Geography.
D. E. Walling, and I. D. L. Foster.
Journal of the Institution of Water Engineers and Scientists, Vol. 32, No. 4, p 341-352, July 1978. 6 fig, 3 tab, 19 ref.

Descriptors: *Water quality, *Watersheds(Basins), *Nitrates, *On-site data collections, Droughts, Data collection, Sampling, Analysis, Magnesium, Streamflow, Rainfall, Seasonal, Autumn, Monitoring, Rivers, Foreign countries, Foreign research, *England, *River Exe(England).

The existence of a water quality sampling network within the catchment of the river Exe, in Devon, has provided an apportunity to assess the impact of the 1976 drought and subsequent autumn rainfall on nitrate levels in stream flow. Comparisons were made with data from previous years. Analysis of data collected at different sampling frequencies indicated that the 1976 drought produced a unique pattern of nitrate behavior. Concentrations increased rapidly during the onset of the post-drought rainfall, and levels recorded subsequently

included one case which was over 45 times higher than those previously encountered at that time of year. Concentrations of up to 903.6 mg/l (NO3-N) were recorded at the outlet of a tile drain system. It was suggested that the marked increase in nitrate levels can be related to the influence of the extreme drought conditions on mineralization and nitrification processes within the soil. The Exe basin covers a drainage area of 1,462 sq km and includes a diversity of rock types, ranging from the indurated slates and grits of the Devonian, through the shales and sandstones of the Carboniferous, to the marls, sandstones, and breccias of the Permian and Trias. Mean annual precipitation and runoff vary from over 1,800 mm and 1,500 mm, respectively, in the northern upland area of Exmoor, to less than 800 mm and 300 mm in the lowland area at the head of Exe estuary. Land use varies across the area, with mixed farming characteristizing the lowlands underlain by Permian and Triassic strata, permanent pasture predominating on the Carboniferous outcrop, and the appearance of some moorland on the higher areas of Exmoor. (Humphreys-ISWS)
W79-01504

'THERMAL POLLUTION' OF BODIES OF WATER AND THE HYDROLOGIC ASPECTS OF THE PROBLEM,
T. N. Filatova, M. R. Tsippert, I. A. Zair-Bek, V. A. Misyuk, and V. P. Molitvina.
Soviet Hydrology: Selected Papers, Vol 15, No 4, p 257-264, 1976. 5 fig, 5 tab, 17 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 231, p 163-180, 1976.

Descriptors: *Lakes, *Water temperature, *Water pollution sources, *Thermal pollution, Foreign research, Hydrologic aspects, Heated water, Reservoirs, Data collections, Foreign countries, Evaluation, Probability, *USSR.

The planned large-scale development of thermal power engineering threatens bodies of water with so-called thermal pollution because of the discharge into them of waters as 8-12C from the heat exchangers of thermal and nuclear power plants or coolers of industrial enterprises. In the Soviet Union, heated waters are discharged into special reservoirs, multipurpose reservoirs, and lakes. By using statistical methods of computation and generalized water temperature data, the limits of temperature variation and the probability of occurrence of temperatures of a given value can be found. The natural water temperature t was computed for several Russian lakes and reservoirs and was presented in graphs and tables. (Humphreys-ISWS)
W79-01505

THE ADSORPTION OF CHROMIUM (VI) AT THE OXIDE/WATER INTERFACE,
Air Force Civil Engineering Center, Kirtland AFB, NM.
M. G. MacNaughton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 083, Price codes: A03 in paper copy, A01 in microfiche. Report No. AFCEC-TR-75-17, September 1975. 27 p, 8 fig, 2 tab, 34 ref.

Descriptors: *Chromium, *Chemical properties, *Water chemistry, *Water pollution, *Geochemistry, Metals, Chemistry, Trace elements, Chemical wastes, Pollutants, Public health, Water quality, Model studies, Adsorption, Mathematical models, Toxicity, Phosphates, Heavy metals, *Chromium compounds.

Because of its toxicity, chromium has a potential environmental impact, and it is imperative that mechanisms which control the movement of this meta through the environment be known. It has been documented that adsorption to suspended and deposited materials is important in controlling the concentration of heavy metals in natural waters. Numerous previous investigators have been concerned with the adsorption of hydrolyzable heavy metals; however, chromium exists in aqueous solution as the anionic oxocomplex. In this report, data on adsorption of chromium and phosphate were compared at the water interface of various metal oxides. The conclusions of this investigation were: (1) for A1203, both chromium and phosphate adsorb at low pH's; however, upon increasing pH, there is a decrease in the percentage adsorption; (2) chromium adsorption decreases with increasing ionic strength; (3) phosphate exhibits a higher specific adsorption energy than does chromium; (4) adsorption of both chromium and phosphate is low for solids which have isoelectric points at low pH's; and (5) with a more valid method of determining the surface potential other than the Nernst equation, the simple electrical double layer model can be used to give reasonable predictions of the pH and surface charge response for adsorption of anions. (Henley-ISWS)
W79-01514

CONCEPTUAL AND MATHEMATICAL MODELING OF THE HANFORD GROUNDWATER FLOW REGIME,
Atlantic Richfield Hanford Co., Richland, WA.
R. C. Arnett, R. A. Deju, R. W. Nelson, C. R. Cole, and R. E. Gephart.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-ST-140, Price codes: A06 in paper copy, A01 in microfiche. Report ARH-ST-140, October 1976. 109 p, 13 fig, 1 tab, 58 ref, 1 append. ERDA E(45-1)-2130.

Descriptors: *Groundwater movement, *Water pollution, *Model studies, *Mathematical models, *Columbia River, *Washington, Pollutants, Path of pollutants, Radioactive wastes, Groundwater, Radioactive waste disposal, Computer models, Computer programs, Flow, Geology, *Hanford Atomic Reservation(Wash).

Disposal of radioactive wastes to surface disposal sites at the Hanford Atomic Reservation has resulted in some radioactive and chemical contamination of the underlying groundwater flow systems. In support of the Hanford groundwater management effort, a preliminary conceptual model of the groundwater system was formulated as a first step in understanding possible contaminant movement. The mathematical modeling capabilities needed for better understanding and prediction of such contaminant movement were discussed in this paper; and the state-of-the-art in groundwater modeling as related to Hanford was summarized, with emphasis upon computer solution methods. An inventory of potentially applicable codes available both at Hanford and elsewhere was included. The areas where groundwater modeling capability is lacking were outlined, and the steps needed to overcome such deficiencies were discussed. (Sims-ISWS)
W79-01522

THREE-DIMENSIONAL FLOW SIMULATION IN ESTUARIES,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W79-01524

GEOCHEMISTRY OF GROUND WATER, SOUTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
J. M. Darr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 231, Price codes: A06 in paper copy, A01 in microfiche. M.A. Thesis, May 1978. 113 p, 28 fig, 17 tab, 60 ref. OWRT A-086-MO(2). 14-34-0001-6026. 7053 and 7054.

Descriptors: *Groundwater, *Water quality, *Brackish water, *Geochemistry, *Missouri, Calcite, Dolomite, Hydrogen ion concentration, Aquifers, Water pollution, Groundwater resources, Water utilization, Groundwater movement, Sampling, Wells, Saline water intrusion, Water table aquifers, Water table, Potable water.

The geochemical and microbiological characteristics of the groundwater in Bates, Vernon, and Barton Counties in southwestern Missouri were investigated in relation to problems involving invasion of aquifers by brackish water. Minerology of Pennsylvania sandstones and limestones in the area were determined by standard methods and water samples were obtained from 70 farm and municipal water supply wells. Analysis of the groundwater data revealed the presence of a northwest-southeast trending salinity gradient, with water in northwest and central parts of the area unsuitable for human consumption. Bacteriological analysis detected sulfate reducing bacteria. Mineral studies showed that water is in equilibrium with calcite and dolomite and suggest that the presence of ferrous iron enhances stability of dolomite relative to calcite. The relationships between dissolved sodium, potassium, magnesium, silica, and pH indicate that the water is in equilibrium with albite, potash feldspar, quartz and illite but not kaolinite. Relationships between dissolved sulfur, carbon, iron, pH, and pE indicate that the groundwater is not a redox equilibrium. The rates amd migration patterns of brackish water established from records from 1966-1975 indicate that movement of selected isochlors is intruding the area along an east-southeast trends, probably in response to regionally reduced water levels resulting from groundwater withdrawal. Further use of groundwater resources in this region by increased industrialization would increase rate of salt water intrusion and the size of area affected. (Majtenyi-IPA)
W79-01535

PREDICTING THE ANAEROBIC DEGRADATION OF ORGANIC CHEMICAL POLLUTANTS IN WASTE WATER TREATMENT PLANTS FROM THEIR ELECTROCHEMICAL REDUCTION BEHAVIOR,
Montana State Univ., Bozeman. Dept. of Chemistry.
R. D. Geer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 224, Price codes: A04 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report Number 95, Montana State University, Bozeman, July 1978. 61 p, 34 fig, 3 tab, 19 ref, 4 append. OWRT A-097-MONT(1). 14-34-0001-7055.

Descriptors: *Anaerobic digestion, *Organic wastes, *Oxidation-reduction potential, *Reduction(Chemical), Waste treatment, Sludge digestion, Electrochemistry, Degradation, Alklhalides, Aromatic nitro compounds, Iron porphyrins, Rate constants, Methoxychlor, Bifenox, Mirex, Tetrachloronitrobenzene.

The results of this study show the rather general and simple hypothesis, that the redox potential of an organic pollutant along controls its ability to degrade anaerobically, to be incorrect. The results support the concept that reduced iron porphyrins in anaerobic systems mediate the degradation of some specific types of organic compounds. Good data on the rate of degradation of four compounds in sewage sludge were obtained. The rate constants for the alkyl halide types were Mirex, -0.0008 hr-1 and Methoxychlor, -0.40 hr-1. The aromatic nitro containing compounds had rate constants of -0.53 hr-1 for 2,3,5,6-tetrachloronitrobenzene and -0.26 hr-1 for Bifenox. The nitro compounds were reduced to corresponding anilines and did not lose aromatic chlorines. The alkyl halide compounds had a chlorine replaced with a hydrogen. The other types of compounds did not appear to degrade under the experimental conditions. The redox potential of the anaerobic system was important in determining how its degradation proceeds. The tetrachloronitrobenzene did not react if the redox potential of the sludge was less negative than -0.38 volts relative to an SCE electrode. (Hunt-Montana)
W79-01539

HYDROLOGIC CHARACTERISTICS OF COAL-MINE SPOILS, SOUTHEASTERN MONTANA,
Montana Coll. of Mineral Sciences and Technology, Butte.
W. A. Van Voast, R. B. Hedges, and J. J. McDermott.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 223, Price codes: A03 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report Number 94, Montana State University, Bozeman, June 1978. 34 p, 9 fig, 4 tab, 13 ref. OWRT A-077-MONT(1). 14-31-0001-4026.

Descriptors: *Aquifer testing, *Transmissivity, *Hydraulic conductivity, *Spoil banks, *Strip-mines, Coal mine wastes, Groundwater, Water quality, Salts, Trace elements, *Montana, Colstrip(Mont), Sarpy Creek(Mont), Decker(Mont), Ft Union, Powder River, Tongue River, Rosebud mine, Big Sky mine.

Coal beds provide water as well as energy because of their generally fractured character. Hydraulic conductivities of saturated spoils are more diverse than those of the undisturbed coal beds but have comparable average values. Aquifer development in mine spoils is greatest near the bases of the spoils where coarse rubble and wasted coal accumulate. Median concentrations of dissolved solids (major constituents) and of some trace elements are higher in waters from mine spoils than in waters from coal beds. The potential for increased dissolved solids is considered the most significant. The data base of spoils' hydraulic conductivities and water qualities developed in this study will be used for development of predictive techniques for application to future mine area. (Hunt-Montana)
W79-01542

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W79-01543

METAL CONCENTRATIONS (AS, CD, CU, PB AND ZN) IN SHORTHORN SCULPINS, MYOXOCEPHALUS SCORPIUS (LINNAEUS) AND ARCTIC CHAR, SALVELINUS ALPINUS (LINNAEUS), FROM THE VICINITY OF STRATHCONA SOUND, NORTHWEST TERRITORIES,
British Columbia Research Council, Vancouver.
A. Bohn, and B. W. Fallis.
Water Research, Vol. 12, p 659-663, 1978. 2 fig, 2 tab, 9 ref.

Descriptors: *Metals, *Sculpins, *Cadmium, *Copper, *Lead, *Zinc, Fish physiology, Animal metabolism, Path of pollutants, Size, Standards, Marine fish, Industrial wastes, Canada, Arctic, *Arsenic, *Tissue analysis, *Arctic char, Strathcona Sound, Shorthorn sculpins.

Concentrations of arsenic, cadmium, copper, lead, and zinc were determined in muscle and liver tissues from shorthorn sculpins and landlocked Arctic char collected in the vicinity of Strathcona Sound, N.W.T., prior to industrial activity. The concentration of arsenic in both muscle and liver tissue from shorthorn sculpins displayed a positive correlation to body weight over the entire size range, and substantially exceeded the maximum recommended level for arsenic in marine animal products established by the Canadian Food and Drug Directorate. The concentrations of the other four elements were either not correlated to body weight or else the data were non-linear. No correlation between the metal concentrations and body weight was found in Arctic char. (EIS-Deal)
W79-01552

POSSIBLE CHANGES IN AEROSOL COMPOSITION DUE TO DEPARTURE FROM EQUILIBRIUM CONDITIONS DURING SAMPLING,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W79-01554

STUDIES ON THE DECOMPOSITION OF ALLOCHTHONOUS DETRITUS IN TWO SOUTHERN CALIFORNIA STREAMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
S. D. Hart, and R. P. Howmiller.
Verh. Internat. Verein. Limnol. 19 Stuttgart, November 1975, p. 1665-1674. 6 fig, 10 ref. (California Water Resources Center Project UCAL-WRC-W-492). OWRT A-055-CAL(2).

Descriptors: *Detritus, *Decomposing organic matter, *Streams, Leaves, *California, Water pollution sources, Goleta(Calif), Santa Barbara(Calif).

It is clear from numerous studies that the ecosystems of most undisturbed streams, and to a greater or lesser degree, those of disturbed streams as well, depend upon detritus of terrestrial origin as the primary source of biological energy. Often tree leaves, in relatively intact condition, are an important component of the allochthonous detritus. While a number of investigators have attempted to measur the amount of tree leaves entering streams and the rate of decomposition of leaves within the streams, only a few have considered the question of difference between leaves of various tree species in rate of decomposition and utilization by the stream biota. There has similarly been little effort to compare rates of decomposition of leaves in different streams. This paper discusses the results of a study comparing rates of decompostion of leaves of locally important trees in two southern California streams. (Snyder-Calif, Davis)
W79-01588

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A), APPENDIX A: IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01597

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A) APPENDIX B: THE INFLUENCE OF COLLOIDAL ORGANIC MATTER (COM) UPON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5C.
W79-01598

APPLICATION OF GEOTECHNICAL THEORIES TO THE LANDFILL DISPOSAL OF PAPERMILL SLUDGES,
Maine Univ. at Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W79-01620

A STUDY OF LEACHATE FROM DREDGED MATERIAL IN UPLAND AREAS AND/OR IN PRODUCTIVE USES,
SCS Engineers, Long Beach, CA.
J. L. Mang, R. J. Lofy, J. C. S. Lu, and R. P. Stearns.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 897, Price codes: A20 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-20, June 1978. 435 p, 1 apend, 99 tab, 52 fig, 159 ref.

Descriptors: *Leachate, *Leaching, *Lysimeters, *Dredged material, *Containment areas, *Waste disposal sites.

A laboratory lysimeter study was conducted to determine the composition of subsurface leachates generated from each of five differnet dredged materials, each combined with one of two different subsurface soil profiles. Sixteen 30-cm-diam Plexiglas lysimeter columns were consecutively filled with equal depths of homogeneous, oxidized native soil and anoxic dredged material (total profile of 60 cm). The dredged materials were obtained from various land disposal areas. The primary leaching solution was distilled water (rainwater leach). Other leaching fluids consisted of distilled water acidified to pH 4.5 with sulfur dioxide, hard water buffered with bicarbonate, and leaching fluids containing high organic contents. Results indicate that leachate quality may be governed by both the dredged material and underlying soil. The leachates (interstitial water) from the dredged material tended to show slight time-dependent increases in pH, Eh, total organic carbon, alkalinity, and manganese. Concentrations of soluble total phosphorus, orthophosphate phosphorus, and magnesium remained relatively stable, while soluble organic and ammonium nitrogen, copper, calcium, sodium, and potassium showed continual decreaes in concentration. Cadmium and zinc trends were highly variable during the course of the leaching tests. Chlorinated trends were highly variable during the course of the leaching testes. Chlorinated hydrocarbons (PCB's and chlorinated pesticides) were generally at undetectable levels. (WES)
W79-01660

FEEDLOT POLLUTION: A SOLVABLE PROBLEM.
South Dakota Farm and Home Research, Vol 21, No 2, p 30-31, Spring, 1970.

Descriptors: *Agricultural runoff, *Water pollution, *South Dakota, *Feedlots, Land management, Precipitation(Atmospheric), *Farm wastes, Retention ponds.

While he was a civil engineering graduate student at South Dakota State University, Paul Thormodsgard did research on snow and rainfall runoff from certain feedlots. He deducted that good land management could be a more feasible answer to feedlot pollution than expensive waste treatment. He found that a large ditch and a plowed field between the feedlot and a stream diminished the waste runoff. He also suggested that waste introduced into a stream in times of flood may be diluted by the large amounts of water. Thormodsgard pointed out that feedlot runoff is related to type of precipitation and could be held in retention ponds or possibly in a plowed field until conditions are right for its release. (Sanders-East Central)
W79-01671

SOURCES OF HEAVY METALS IN SEDIMENTS OF THE HUDSON RIVER ESTUARY,
Lamong-Doherty Geological Observatory, Pallisades, NY.
S. C. Williams, H. J. Simpson, C. R. Olsen, and R. F. Bopp.
Marine Chemistry, Vol 6, No 3, May 1978, p 195-213, 5 fig, 7 tab, 32 ref.

Descriptors: Environmental effects, *Water pollution sources, Sediments, Estuaries, *Hudson River, Deposition(Sediments), *Heavy metals, Zinc, Copper, Lead, Cesium, Manganese.

Zinc, copper and lead in Hudson River sediments are from three general sources of comparable magnitude; preindustrial natural sources of weathering; diffuse recent contamination throughout the estuary; and sewage, industrial effluent and urban runoff. The distribution of Cs137 corresponds with that of sediments with recent metal contamination, and provides a good indication of the pattern of pollutant metal accumulation. The depth to which pollutant metals are found in Hudson sediments is similar to the depth distribution of Cs137. Amounts of Fe in Hudson estuary sediments was reasonably constant, but Mn concentration varied over an order of magnitude with greater values near the surface in low-salinity and fresh-water areas. Pollutant copper added to the harbor appears to be rapidly deposited in the sediments. (Chilton-ORNL)
W79-01678

BACTERIAL AEROSOLS FROM COOLING TOWERS,
Army Dugway Proving Ground, UT.
For primary bibliographic entry see Field 5C.
W79-01694

THE PHOSPHORUS STATUS OF THE SEDIMENTS OF THREE EUTROPHIC LAKES IN VICTORIA,
La Trobe Univ., Bundoora (Victoria). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5C.
W79-01697

USE OF FECAL STREPTOCOCCI AS INDICATORS OF POLLUTION IN SOIL,
Oregon State Univ., Corvallis. Dept. of Microbiology.
H. J. Kibbey, C. Hagedorn, and E. L. McCoy.
Applied and Environmental Microbiology, Vol. 35, No. 4, p 711-717. April 1978, 2 fig, 5 tab, 16 ref. OWRT B-048-ORE(1).

Descriptors: *Soil pollution, *Sewage disposal, Waste disposal, Potable water, *Bioindicators, Water pollution sources, *Streptococcus.

The survival, recovery, and identification of Streptococcus isolates from soil was investigated by (1) examination of survival in soil under different moisture and temperature conditions, (2) evaluation of media combinations for recovering fecal streptococci from soil, and (3) partial identification of isolates from diverse habitats. Cool, moist conditions prolonged the survival of Streptococcus faecalis in soil for at least 12 weeks, whereas freezing was lethal, with the populations being reduced up to 95% when several freeze-thaw treatments occurred. Media evaluations indicated that both the efficiency of recovery and enumeration of the fecal streptococci from soil can be influenced by the combination of media used. Taxonomic data revealed a need to develop procedures to differentiate between isolates of fecal origin and plant-derived streptococci that possess many of the cultural reactions of S. faecalis. Recent fecal isolates exhibited a much greater incidence of multiple antibiotic resistance than soil or vegetation isolates, and this characteristic, coupled with the use of enterococci as indicators of fecal contamination in soil systems, is discussed.
W79-01738

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W79-01750

ARSENIC POLLUTION FROM UNDERDRAINAGE AND RUNOFF FROM GOLF GREENS,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
R. L. Duble, J. C. Thomas, and K. W. Brown.
Agronomy Journal, Vol. 70, No. 1, p 71-74, January-February, 1978. 4 fig, 6 ref.

Descriptors: Golf courses, *Arsenicals(Pesticides), *Pollutants, Leachate, Runoff, *Return flows, Sprinkler irrigation, Turf grasses, *Water pollution sources.

A field study was conducted using four lysimeters (each 3 m by 3 m) containing a Tabor sandy loam soil (Udertic Paleustales) and 16 lysimeters containing different sand-soil-peat mixtures, each equipped with a gravel underdrainage system. Bermudagrass (Ckynodon dactylan L.) turf was maintained at a height of approximately 1 cm throughout the investigation. Sprinkler irrigation was used to apply approximately 1 cm of water daily. Tricalcium arsenate was applied on two dates at a rate of 88 kg ha-1. Arsenic was found in significant concentrations in both drainage and runoff from lysimeters. Particularly high concentration (8 ppm As) were found in the drainage from plots previously cored for soil samples. Concentrations of As in the runoff were as great as 14 ppm when a heavy rain occurred shortly after application of Ca3(AsO4)2. Drainage from the plots typically contained 1 to 3 ppm and decreased slowly with time. Arsenic concentrations of 0.8 ppm were still found in the drainage 115 days after application. Concentrations of As in the runoff and drainage from all the plots exceeded acceptable limits for irrigation water established by the U.S. Public Health Service. (Skogerboe-Colorado State)
W79-01752

EFFECT OF SOIL MIXTURES AND IRRIGATION METHODS ON LEACHING OF N IN GOLF GREENS,
Delaware Univ., Newark. Dept. of Plant Science.
W. H. Mitchell, A. L. Morehart, L. J. Cotnoir, B. B. Hesseltine, and D. N. Langton, III.
Agronomy Journal, Vol. 70, No. 1, p 29-35, January-February, 1978. 5 fig, 5 tab, 15 ref.

Descriptors: *Leaching, Golf courses, Nitrogen, *Nitrates, Mixing, Sprinkler irrigation, *Subsurface irrigation, Environmental effects, *Turf grasses, Inhibitors, *Bentgrass, *Nitrapyrin.

The influence of soil mixtures, irrigation systems, and N sources on N leaching was studied in experimental, though functional, golf greens from 1973 to 1976. Sprinkler irrigation was compared with subsurface irrigation. Soil mixtures contained from 60 to 80 percent sand and variable amounts of silt loam topsoil, calcined clay and humus. Nitrogen treatments, included activated sewage sludge, ureaform, ammonium nitrate, 30 percent N solution, anhydrous ammonia and nitrapyrin. Nitrogen leached primarily as NO3-N. Even though about 75 percent of the added was NH4-N, N solution (30 percent N) applied through the subsurface irrigation system caused a sharp increase in NO3-N in the drainage water. Anhydrous ammonia with or without nitrapyrin reduced NO3-N leaching losses for 1 to 2 weeks but had little effect on the average NO3-N concentration over a 47-day period. Subsurface irrigation stimulated turfgrass growth in bands about 20 cm wide located above the irrigation lines. Appearance of growth bands was associated with low temperatures and increased levels of NO3-N in proximity to the irrigation lines. Banding was most apparent in soil mixtures containing low levels of residual soil N and absent when turfgrass was adequately fertilized with N. (Skogerboe-Colorado State)
W79-01777

POSSIBLE TRACE METAL MOBILIZATION OF SELECTED TRACE ELEMENTS FROM OIL-IMPACTED SEDIMENTS,
Colorado Univ., Boulder. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W79-01807

REPORT ON THE QUALITY OF THE WATER OF THE JAMES RIVER, SOUTH DAKOTA, 1970.
Environmental Protection Agency, Denver, CO. Technical Support Branch.
For primary bibliographic entry see Field 5G.
W79-01837

POLLUTION CONCENTRATIONS IN RUNOFF WATER FROM REFUSE PILES,
Auburn Univ., AL. Dept. of Chemical Engineering.
J. A. Guin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 487, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute Bulletin 26, Auburn University, March, 1977, 39 p, 9 fig, 1 tab, 35 ref. OWRT B-056-ALA(3).

Descriptors: *Water quality, *Leachate, *Mass transfer model, *Refuse, Solid waste, Waste disposal, *Water pollution sources, *Weathering, *Leaching, Model studies, Precipitation(Atmospheric), Rainfall, Runoff, Nonpoint pollution sources.

In the processes of removal, refinement and disposal of raw materials, large quantities of waste products become exposed to weathering forces. Subsequent percolation, flushing, and oxidation results in the pollution of waterways, low-lying farmlands and underground aquifers with acidity, alkalinity, hardness, heavy metals, and undesirable organic materials such as tannin and lignin. The need for methodology for estimating the chemical nature and quantity of these leachates becomes more compelling as the extraction of natural materials accelerates. In this work a mass transfer model is formulated which describes the leaching of such pollutants from refuse piles. Certain parameters appearing in the model are studied experimentally using an idealized refuse pile constructed of a difficultly soluble solid. Correlations for mass transfer coefficients in trickling flow and in nonuniform mixtures are developed from these experiments. Finally, the model is applied to an actual refuse pile under natural precipitation and weathering conditions and found to adequately represent the pollutant concentrations in the rainfall runoff.
W79-01892

COMPUTING EVAPORATION FOR INLAND WATER BODIES UNDER A VARIETY OF FETCH AND ATMOSPHERIC STABILITY CONDITIONS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 2D.
W79-01895

EFFECTS OF THERMAL DISCHARGE UPON A SUBARCTIC STREAM,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. F. Carlson, T. Tilsworth, and C. Hok.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 369, Price codes: A04 in paper copy, A01 in microfiche. Report IWR-49, June 1978. 66 p, 22 fig, 6 tab, 11 ref, 2 append. OWRT B-020-ALAS(1).

Descriptors: Sanitary engineering, Thermal discharge effluents, Water quality, *Alaska, Cold regions, Rivers, *Chena River(Alas), *Thermal pollution, Powerplants, Dissolved oxygen, Temperature, Cooling water.

The Fairbanks Municipal Utilities System power plant uses the Chena River, a subarctic stream, as its primary cooling water discharge source. The heated discharge has a number of effects, the most notable of which is the creation of an extensive downstream open water section during the winter when the river is normally ice covered. The study results showed the following effects: (1) The present MUS thermal discharge does not increase appreciably the temperature of the Chena River because of the relatively small discharge volume compared to the Chena River flow. (2) The discharge causes an open reach of water which varies from 8 to 15 acres during the winter and extends from 1/4 to 1/2 mile downstream. (3) The variation in extent of the open stretch may be controlled by discharge method: a surface spreading scheme results in a faster but more concentrated heat and water vapor rejection, and a direct jet discharge results in the heat and vapor rejection being slightly more spread. (4) A notably beneficial effect of the thermal discharge on the stream is a definite improvement in the DO content of the river as it passes through the MUS discharge reach.
W79-01898

INTERACTION OF CHLORINE AND ORGANIC MOLECULES--EFFECTS OF INORGANICS,
Rhode Island Univ., Kingston. Coll. of Pharmacy.
Y. Shimizu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 391, Price codes: A02 in paper copy, A01 in microfiche. Rhode Island Water Resources Center Final Report, 1978. 18 p, 12 fig, 4 ref. OWRT B-076-RI(1), 14-34-0001-7184.

Descriptors: *Chlorination, Amino acid, Ferric ions, Manganese ions, Catalysts, *Chlorine, *Organic molecules, *Chemical reactions, *Phenylalamine, Waste water treatment, Organic matter.

The effects of heavy metal ions, particularly ferric and manganese ions on reactions of organic molecules and chlorine in aqueous media were studied. The conversion of amino acids (phenylalanine) to the corresponding aldehydes and nitriles by chlorine treatment was remarkably enhanced in the presence of ferric ion. In particular the enhancement was more evident with the nitrile compound production. The result implies that both the rates and courses of reactions between organics and chlorine (hypochlorite) can be altered greatly in the water containing a high concentration of ferric ion. Also it implies a rapid depreciation of active chlorine in such water. No catalyzing effect was observed with manganese ion.
W79-01903

COMPUTER MODEL FOR PREDICTING POLLUTION IN THE MISSOURI,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
H. Liu, and H-D. Cheng.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 392, Price codes: A06 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Completion Report, November 15, 1978. 93 p, 40 fig, 7 tab, 47 ref, 2 append. OWRT A-103-MO(2), 14-34-0001-8027.

Descriptors: Accidental spills, Dispersion, Dispersion coefficient, Fickian model, Dispersion, Modified Fickian models, Non-Fickian models, Pollution forecasts, Rivers, River pollution, Streams, Water pollution sources, *Model studies, *Computer models, *Forecasting, *Missouri.

Whenever there is an accidental spill of hazardous chemicals or radioactive materials into any river, it is vitally important to be able to issue an immediate forecast of the arrival time and peak concentration of a pollutant at each downstream city, to enable water users downstream to take effective precaution measures. Adequate forecast of this type was not possible in the past because of the lack of a proper model to predict one-dimensional dispersion in natural streams. This study resulted in the development of an improved model. The new model is a modified Fickian model which uses a time-dependent dispersion coefficient, a time-scale much greater than the Fischer time-scale, and a Pearson-Type-III distribution of concentration.
W79-01905

OCCURRENCE OF IRON BACTERIA IN GROUND WATER SUPPLIES OF ALABAMA,
Auburn Univ., AL. Water Resources Research Inst.
N. Valkenburg, R. Christian, and M. Green.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 575, Price codes: A04 in paper copy, A01 in microfiche. Geological Survey of Alabama Circular 96, 1975, 45 p, 11 fig, 5 tab, 38 ref, 2 append. OWRT B-045-ALA(2).

Descriptors: *Iron bacteria, *Water wells, Groundwater, Water supply, *Alabama, Water pollution sources, Sampling, *Gallionella, Sphaerotilus.

A state-wide survey was conducted in Alabama to determine the occurrence and the distribution of iron bacteria in water wells and to obtain information useful in alleviating problems caused by these organisms. Of 109 well water samples, 59 (54 percent) contained Gallionella and 33 (30 percent) contained Sphaerotilus-like sheaths as revealed by microscopic examination. Of the 59 microscopically positive samples for Gallionella 23 (39 percent) yielded cultures. At least one type of iron bacteria was identified in 27 of the 35 counties where samples were collected. These organisms were found in 54 wells, in 3 streams, in surface deposits around 2 springs and 8 wells, and there was evidence that they were present in some soils. Only future experimentation will determine whether a chemical 'cure' for wells is feasible. It is recommended that drillers use clean drilling water, circulation tanks, normal development techniques, and disinfection of completed or repaired wells to prevent future iron bacteria inoculation.
W79-01908

GEOCHEMICAL INTERPRETATION OF KINGS MOUNTAIN, NORTH CAROLINA, ORIENTATION AREA,
Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
V. Price, and R. B. Ferguson.
Available from the National Technical Information Service, Springfield, VA 22161 as DP-MS-77-10, Price codes: A02 in paper copy, A01 in microfiche. Report No. DP-MS-77-10, March 1977. 17 p, 14 fig, 2 tab, 16 ref. ERDA AT(07-2)-1.

Descriptors: *Geochemistry, *Uranium radioisotopes, *Sediments, *North Carolina, *Geology, *Chemical properties, Trace elements, Water chemistry, Chemical analysis, Analytical techniques, Neutron activation analysis, Instrumentation, Analysis, Testing procedures, Testing, *Uranium, *Kings Mountain(NC), *Uranium compounds, *Uranium monazite, Stream sediments, Uranium exploration.

The Kings Mountain area was chosen for study primarily because of the reported presence of high-uranium monazite. This 750 sq mi area is in the deeply weathered southern Appalachian Piedmont and spans portions of the Inner Piedmont, Kings Mountain, and Charlotte geologic belts. Along the Inner Piedmont-Kings Mountain belt boundary, lithium is being mined; and tin, beryllium, and mica have been mined from pegmatites. Uraninite has been reported from one mica mine. The Cherryville Quartz Monzonite of the Inner Piedmont is the reputed source of Li-BE pegmatites. Uranium concentration maps for -100 to +200 mesh stream sediments indicate the area of monazite abundance. Several samples with more than 100 ppm uranium content appear to be high in uranium-rich resistate minerals. When the uranium content of sediment samples is ratioed to the sum of Hf, Dy, and Th, the anomaly pattern shifts to coincide with uranium highs in ground and surface water samples. False anomalies from concentrations of monazite (Ce, ThPO4), xenotime (Y, DyPO4), and zircon (Zr, HfSiO4) in stream sediment samples thus can be eliminated. Residual anomalies should be related to unusual uranium enrichment of these common minerals or to the presence of an uncommon uranium-rich mineral. Tantalum, beryllium, and tin in stream sediments correspond to high concentrations of uranium in stream and groundwater, but not to uranium in sediments. In an initial reconnaissance, several media should be sampled, and it is essential to correct uranium in sediments for the sample mineralogy. (Henley-ISWS)
W79-01912

BIODEGRADATION OF OIL SLICKS IN THE MARINE ENVIRONMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Biochemistry and Microbiology.
R. Bartha.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 739, Price codes: A02 in paper copy, A01 in microfiche. Report No. N00014-67-A-0115-0005, November 1, 1976. 14 p, 31 ref. ONR N00014-67-A-0115-0005.

Descriptors: *Oil spills, *Microbial degradation, *Oil pollution, *Water pollution treatment, Oil, Fuels, Oil wastes, Water pollution, Marine microorganisms, Water quality, Biodegradation, Pollutants, Nutrients, Fertilization, Orgaic compounds.

The degradation of petroleum hydrocarbons by marine bacteria was studied, with the ultimate aim of using this process in the cleanup of polluting oil. Hydrocarbon-utilizing marine bacteria were isolated, and their growth requirements and metabolic pathways were studied. Enzymatic and regulatory mechanisms responsible for the recalcitrance or delayed utilization of certain hydrocarbons, e.g., polynuclear aromatics and highly branched isoalkanes, were identified. The abundance and distribution of hydrocarbon degrading bacteria were measured in New Jersey coastal waters. The limiting factors of oil biodegradation in the marine environment were studied. Besides the nature of the oil itself, water temperature and mineral nutrients (N, P, Fe) were found to be the most important limiting factors. Given favorable water temperatures, the rate of oil biodegradation can be increased by an order of magnitude or more by supplying the above mineral nutrients to a floating oil slick in oil-soluble (oleophilic) form. This method of application prevents nutrient loss by dilution and does not trigger algal blooms. The patented procedure was considered to be a new cost-effective way to cleanup oceanic oil spills. (Henley-ISWS)
W79-01913

THE CONTRIBUTION OF MERCURY AND CHLORINATED ORGANICS FROM URBAN RUNOFF,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
C. B. Murphy, Jr., and D. J. Carles.
Water Research, Vol. 12, No. 8, p 531-533, 1978. 3 fig, 1 tab, 4 ref.

Descriptors: *New York, *Mercury, *Chlorinated hydrocarbon pesticides, *Urban runoff, *Combined sewers, Rainfall intensity, Rates, Antecedent precipitation, Suspended solids, Sampling, On-site investigations, Toxins, Correlation analysis, Overflow, Annual loadings, Rainfall duration.

The concentration of mercury and chlorinated organics in the combined sewer overflows of Rochester, New York, was measured. The resulting annual loadings of 0.034 kg/ha (0.034 pounds/acre) and 0.011 kg/ha (0.01 pounds/acre) of mercury and chlorinated organics measured in urban runoff are significant. A high degree of correlation exists between the measured concnetration of the toxicants when compared with rainfall intensity, rainfall duration, antecedent number of dry days, and the total suspended solids concentration characteristic of the combined wastewater. (Visocky-ISWS)
W79-01918

TRANSPORT OF REACTIVE SOLUTES DURING TRANSIENT, UNSATURATED WATER FLOW IN MULTILAYERED SOILS,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy; and Louisiana Agricultural Experiment Station, Baton Rouge.
For primary bibliographic entry see Field 2G.
W79-01921

HYDROLOGIC PROBLEMS IN KARST REGIONS.
For primary bibliographic entry see Field 2F.
W79-01932

ALPHA RADIATION MONITORING OF NATIONAL PARK SERVICE ADMINISTERED CAVES IN UNITED STATES,
National Park Service, Santa Fe, NM. Southwest Region.
For primary bibliographic entry see Field 2F.
W79-01943

NUMERICAL SIMULATION OF WATERSHED RESPONSE USING THE UNIFIED TRANSPORT MODEL - PART II. VALIDATION STUDIES,
Union Carbide Corp., Oak Ridge, TN. Computer Sciences Div.
For primary bibliographic entry see Field 2A.
W79-01947

EVALUATION OF SULFATE WATER QUALITY IN THE NORTH-CENTRAL KENTUCKY KARST,
Bethel Research Association, Louisville, KY.
A. I. George.
In: Hydrologic Problems in Karst Regions; Pro-

ceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 340-356, 1977. 10 fig, 3 tab, 33 ref.

Descriptors: *Karst, *Water quality, *Kentucky, *Groundwater, Caves, Geomorphology, Aquifers, Carbonate rocks, Sulfates, Limestones, Carbonates, Mineralogy, Spatial distribution, Areal, Maps, Data collections, Petrology, Evaporites.

Sebkha lithology in the North-Central Kentucky Karst is responsible for the distribution of a high sulfate water quality enclave. The highest concentration of sulfate groundwaters (22-1350 mg/l) exists as a lozenge-shaped enclave positioned over the northwest trending, up dip, zero edge of the lower St. Louis evaporite interval. Interstratal karstification is subroding these evaporite beds and producing high dissolved sulfates. Found throughout the mid-Mississippian Plateau karst at the Salem-St. Louis Limestone contact are: calcareous tufa aprons, dams, and/or marl (algal) biscuits. They may indicate the position of a neo-paleogenic high sulfate karstic resurgence. Certain rare cave occurring sulfates--epsomite, hexahydrite, blodite, mirabilite, and authigenic gypsum, barite, and celestite--have been described from the Flint-Mammoth supersystem. This is the same suite of sulfate minerals known from recent and fossil sebkhas. Barite and celestite filled geodes occur east of the sulfate enclave in the Muldraugh Member. It is possible that the Mississippian sebkhas are the common source of sulfates both to the Muldraugh Member and to sub-sediments in cave passages. (See also W79-01932) (Humphreys-ISWS)
W79-01966

CHLORIDE ION VARIATIONS IN SOME SPRINGS OF THE GREEN-BRIER LIMESTONE KARST OF WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
E. Werner.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 357-363, 1977. 3 fig, 3 tab, 5 ref.

Descriptors: *Karst, *Water quality, *West Virginia, *Springs, Groundwater, Limestones, Chlorides, Ions, Variability, Water pollution, Salts, On-site investigations, Data collections, *Pocahontas County(WVa), Road salts.

Chloride ion levels were measured in a number of karst springs in northern Pocahontas County, West Virginia, to determine spatial and temporal variations. A fish hatchery derives its water supply from a number of the springs, some of which derive water from streams draining the major highway of this area, and there is some concern about pollution of the springs by road salt. There are severeal drainage basins nearby which differ only in that they do not have a highway, and thus they can be used for comparison purposes. Chloride values did not reach damaging levels in any of the springs during the course of this study. Short period high levels were measured during snowmelt times in the springs draining the highway. These springs also exhibit year-round levels considerably higher than nearby basins without highways. These high levels are attributed to a transfer of chloride-laden water from the surface to the subsurface diffuse flow system during the winter, and a transfer from the diffuse system to the subsurface conduit system throughout the year, with storage in the diffuse system for periods of on the order of one year. (See also W79-01932) (Humphreys-ISWS)
W79-01967

ROAD SALTS AND QUALITY OF GROUNDWATER FROM A DOLOMITE AQUIFER IN THE CHICAGO AREA,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
Z. A. Saleem.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 364-368, 1977. 1 fig, 11 ref.

Descriptors: *Water quality, *Illinois, *Dolomite, *Groundwater, Aquifers, Water pollution, Chlorides, Ions, Salts, Data collections, On-site investigations, *Chicago(Ill), Road salts.

The use of deicing salts during periods of snowfall and highway icing has been continuously increasing since about 1940 in higher latitude areas of the U.S. and other parts of the world. This increased usage has resulted in the impairment of quality of surface and groundwaters of many areas. The quality of surface water and the carbonate groundwaters of a basin in the Chicago Metropolitan area was investigated during the last four years (1972-1975). A comparison of the groundwater quality data with data gathered between 1931 and 1961 shows that concentrations of all ions have increased. Chloride and sodium ions show the largest increases. The largest increase is in the area where the overburden is thinnest. The water quality also varies from season to season. The increases in concentraions of chloride and sodium ions and spatial variations in their concentrations were attributed to highway deicing chemicals, mostly sodium chloride. (See also W79-01932) (Humphreys-ISWS)
W79-01968

HEAVY METAL ADDITIONS TO WATERS OF THE JOPLIN AREA, TRI-STATE MINING DISTRICT, MISSOURI,
Missouri Univ.-Rolla
P. D. Proctor, G. Kisvarsanyi, and E. Garrison.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 369-387, 1977. 10 fig, 2 tab, 21 ref. OWRT B-054-MO(2).

Descriptors: *Aquifers, *Water quality, *Missouri, *Heavy metals, *On-site data collections, Water supply, Groundwater, Surface waters, Water pollution, Zinc, Lead, Copper, Cadmium, Iron, Mercury, Water wells, Springs, Alkalinity, Hydrogen ion concentration, Water analysis, Chemical analysis, Stratigraphy, Sampling, On-site investigations, Karst, *Joplin(Mo).

Joplin, Missouri, population 40,000, in part of the world-renowned Tri-State Mining District, obtains water mainly from Shoal Creek. Webb City and Carterville share a common water supply from wells. Other nearby towns in the area have independent water supplies from wells. Waters come from deep aquifers of Cambrian and Ordovician age. Outside the cities, individual residences obtain water from shallow aquifers of Mississippian age. These age rocks are host to large zinc-lead ore deposits. The rocks in the area are mainly flat-lying, though local broad folds of westerly to northwesterly trend pitch northwest. Faults of similar trend, and with stratigraphic displacements to 300 feet, cut these rocks. Zinc sulfides, together with lead, copper, iron, and minor cadmium sulfides, remain in pillars, and lesser quantities in wall rock and in the extensive mine dumps in the mining area surrounding these cities. A set of dry fall-early winter water samples from a 100 sq mi area around Joplin included 10 deep well, 24 shallow well, 12 stream, 3 spring, and 3 open-pit lake samples. A second set from the same localities was collected in wet spring-early summer. All samples were analyzed for heavy metal (Pb, Zn, Cu, Cd, Fe, Hg) and alkali content by atomic absorption techniques. Alkalinity, pH, and temperature also were determined. Surface waters have average zinc content (542 ppb), about one-half that of the shallow wells and 15 times that of the deep wells. Mean cadmium content (2 ppb) is similar for surface and shallow wells and three times higher than deep wells. Both copper (8 ppb) and lead (3 ppb) have greater average content in the shallow well environment. Average iron content is highest in deep wells (112 ppb), next in shallow wells. Calcium (76 ppm), magnesium (4.1 ppm) and sodium (8.7 ppm) have similar average content in the surface-near surface waters. Waters in the older dolomitic rocks in the deep wells have lesser calcium and almost 5x as much magnesium. Potassium (2.2 ppm) shows about 1 ppm variation in the surface-near surface-deep well environment. Dry fall water samples have higher mean values than wetter season water samples. For the related seasonal water samples in the 100 sq mi area around Joplin, some 25% of the shallow well water samples, 10% of the deep well samples, and 16% of the surface water samples exceeded the recommended Public Health Service drinking water standards for one or more heavy metals. When compared to Missouri effluent standards, most water samples exceed the ratio of 1.0 for heavy metals. An alternate water supply exists in the deep aquifer zone of the Cambro-Ordovician rocks. (See also W79-01932) (Humphreys-ISWS)
W79-01969

GROUND WATER POLLUTION OF A LIMESTONE AQUIFER BY CAUSTIC WASTE,
Geological Survey of Jamica, Kingston. Water Resources Div.
L. A. Wedderburn.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 388-404, 1977. 4 fig, 3 tab, 5 ref.

Descriptors: *Water pollution, *Karst hydrology, *Waste disposal, *Aquifers, Limestones, Karst, Hydrogeology, Ponds, Groundwater, Foreign countries, Foreign research, Sodium, Iron, Alkalis(Bases), Ions, Infiltration, On-site investigations, On-site data collections, *Jamaica, Alumina waste disposal.

Caustic waste known locally as 'red mud' produced from the Bayer process for extraction of alumina from Jamaican bauxite is ponded in karstic depressions where it may infiltrate to the groundwater table. As discharged from the plant, the red mud has a water content of 75% to 85%, but due to the small, almost colloidal solid particles in suspension, settles slowly to about 35% clear supernatant liquid. The pollutants present in the waste (sodium ions, iron hydroxide, organic substances) are in quantities sufficient to make the groundwater unfit for domestic, agricultural, and some industrial uses. Analysis of groundwater in the vicinity of these disposal sites indicated that at 2 of the 5 sites at which the process is carried out, pollution of groundwater has taken place. Waste disposal ponds are located on karstified limestones which have high vertical permeability and are in the direct path of groundwater flow to major groundwater reservoirs; consequently they pose a serious threat to the groundwater reserves of the Island. Remedial actions suggested include better pond management, reduction of caustic and other contaminants in the waste, and groundwater abstraction from the affected areas to contain the spread of the pollutant. (See also W79-01932) (Humphreys-ISWS)
W79-01970

SUBSURFACE WATER BEHAVIOR AND SEWAGE EFFLUENT IRRIGATION IN THE MISSOURI OZARKS,
Missouri Univ., Columbia, School of Forestry, Fisheries and Wildlife.
L. C. Tennyson, and C. D. Settergren.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 411-418, 1977. 5 fig, 2 tab, 10 ref.

Descriptors: *Waste water disposal, *Irrigation, *Missouri, *Monitoring, Subsurface waters, Sewage effluents, Sprinkler irrigation, Water pollu-

tion sources, Vadose water, Groundwater, On-site tests, Methodology, Water quality, Karst, Water levels, Phosphorus, *Missouri Ozarks.

The use of land sites in karst terrain for disposal of wastewater has generated an area of controversy in recent years. Karst groundwater supply systems are often highly vulnerable to contamination from extraneous sources such as waste effluents. This study was designed to investigate the effects of sewage effluent irrigation on the subsurface water of a land disposal site in the Southern Missouri Ozarks. Groundwater and vadose water were monitored to evaluate the renovation potential and water table behavior on a land disposal site. A forest bottomland site was sprinkler irrigated with treated sewage effluent at application rates of 5.1 cm/week and 11.9 cm/week. Ammonium nitrogen levels in vadose and groundwater increased during the 11.9 cm/week schedule. Phosphorus concentrations were not affected by a change in irrigation rate; however, renovation of effluent phosphorus was occurring. Groundwater level and response time varied with the rate of application of effluent. Groundwater level response to irrigation ranged from 0.5 hours to 6.0 hours. Higher irrigation rate produced a shallower water table, a decrease in response time, and an increase in ammonium nitrogen. (See also W79-01932) (Humphreys-ISWS)
W79-01972

THE EFFECTS OF HIGHWAY CONSTRUCTION ON THE HYDROGEOLOGIC ENVIRONMENT AT BOWDEN, WEST VIRGINIA,
Bowden National Fish Hatchery, WV.
E. R. Garton, Jr.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky Univ., Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 439-449, 1977. 8 fig.

Descriptors: *Highways, *West Virginia, *Environmental effect, *Karst, Hydrogeology, Karst hydrology, Construction, Caves, Karst, Springs, Water supply, Water quality, Sinks, Geology, Water pollution sources, Fish hatcheries, *Bowden(WVA).

The Bowden National fish hatchery is the most productive trout hatchery in the United States. The Bowden Hatchery began operations in 1960, and up until January, 1975, it had no problems with water supply. The water supply consists of two karst springs, the North Spring and the South Spring, with an average combined yield of 2,000 gallons per minute. In times of low flow the Shavers Fork River is also used. Construction began on the Elkins-to-Bowden segment of Corridor-H, a part of interstate highway 79, in 1972. In January 1975, excavation operations near Bowden Hatchery began to uncover pits and caverns. This resulted in large quantities of clay and silt being washed into the caverns. Since the caverns are conduits to the South Spring, This spring became very turbid during storms. In one incident more than 150,000 trout died due to silt build-up on their gills which resulted in asphyxiation. Numerous fish kills occurred throughout 1975, as well as fish poisoning by diesel fuels which were spilled on the construction site and washed into the caverns. In addition to turbidity, the newly discovered conduits were beheaded, resulting in reduced flows of the South Spring and near by wells. This study was undertake for the Fish and Wildlife Service to determine the extent of damage to the hydrogeologic environment of the South Spring, and to determine if damage might occur to the North Spring as road construction continues. It was determined by this study that future road construction will adversely affect the North Spring in both quantity and quality of the water. (See also W79-01932) (Humphreys-ISWS)
W79-01975

CONTEMPORARY AND HISTORICAL TRACE METAL LOADINGS TO THE SEDIMENTS OF FOUR LAKES OF THE LAKE WASHINGTON DRAINAGE,
Washington Univ., Seattle. Dept. of Civil Engineering.
D. E. Spyridakis, and R. S. Barnes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 365, Price codes: A05 in paper copy, A01 in microfiche. State of Washington Water Research Center, Washington State University, Pullman, Project Completion Report, 1978, 70 p, 16 fig, 7 tab, 51 ref. OWRT A-083-WASH(1). 14-34-0001-6050.

Descriptors: Water quality, Urban pollution, *Trace metals, Sediment dating, *Lake sediments, Lead, Zinc, Copper, *Washington, Urbanization, Water pollution sources, Lakes, Chemical analysis, Radioactive dating, *Sedimentation rates.

Contemporary and historical loadings of lead, zinc and copper to the profundal sediments of Lakes Washington, Sammamish, Chester Morse and Findley were determined using chemical analysis and 210Pb dating of sediment cores. Elemental sedimentation rates, a cross product of the sedimentation rate and sediment concentration of a given element, were corrected for natural background concentrations and rates, and extrapolated across established sediment accumulating areas to give a conservative estimate of the pollutional trace metal loadings to each lake. The resulting chronological loadings appeared consistent with the known cultural history of the individual watersheds. Substantial alterations in sedimentation rates were noted in all lakes where deforestation, road building, suburbanization or urbanization had occurred in the lake's watershed. The quantities, elemental ratios and pollutional histories of copper, lead and zinc in the lake sediments indicate that aeolian inputs are the dominant source of trace metal pollution to the lake sediments at the present time. Pollutional loading rates of all three metals followed the gradient Washington > Sammamish > Chester Morse > Findley consistent with a gradient of cultural use intensities from extremely urban to wilderness.
W79-01985

A STUDY OF PARAMETER ESTIMATION PROCEDURES OF A MODEL FOR LAKE PHOSPHORUS DYNAMICS,
Wiezmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
For primary bibliographic entry see Field 5C.
W79-01994

NITROUS OXIDE IN THE OXYGEN MINIMUM OF THE EASTERN TROPICAL NORTH PACIFIC: EVIDENCE FOR ITS CONSUMPTION DURING DENITRIFICATION AND POSSIBLE MECHANISMS FOR ITS PRODUCTION,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W79-01997

EUTROPHICATION OF WATER BODIES: INSIGHTS FOR AN AGE-OLD PROBLEM,
Texas Univ.-Dallas, Richardson.
For primary bibliographic entry see Field 5C.
W79-02000

5C. Effects Of Pollution

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 7B.
W79-01512

ECOLOGICAL RECOVERY OF REALIGNED STREAM CHANNELS,
Federal Highway Administration, Portland, OR.
For primary bibliographic entry see Field 6G.
W79-01515

THE EFFECT OF IRRIGATION ON THE SURVIVAL AND DEVELOPMENT OF PARASITIC NEMATODE LARVAE IN WESTERN MONTANA,
Montana State Univ., Bozeman.
D. E. Worley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 225, Price codes: A02 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Research Report Number 96, Montana State University, Bozeman, August 1978. 18 p, 2 fig, 4 tab, 6 ref. OWRT A-093-MONT(1). 14-31-0001-5026.

Descriptors: *Animal parasites, *Larval growth stage, *Irrigation effects, Pasture management, On-site data collections, Dictyocaulus viviparus, Bovine lungworm larvae, *Montana.

Field and laboratory studies were initiated in November, 1975 and continued through November, 1977 to determine the effect of supplementary water applied periodically to pasture plots on the survival of bovine lungworm larvae (Dictyocaulus viviparus). Concurrent observations were made of larval survival on dry land plots which received only natural precipitation. Irrigation had a substantial effect on prolonging larval survival on field plots in which pasture vegetation was artificially reduced to a height of about 3 in. to simulate the effect of grazing or hay harvest. After 35 days, approximately twice as many viable larvae were present on unclipped as compared with clipped lots. Studies on the distance and rate of lateral larval migration on pasture plots indicated that the maximum distance that lungworm larvae moved from their point of origin was 3 in. Lateral movement took place only during the first 48 hrs. after larval deposition on pasturem herbage. Although it was not possible to make direct correlations between meteorologic conditions and larval survival rates, it was found that high soil moisture levels maintained by irrigation stimulated plant growth which in turn created a wind barrier near the ground which reduced wind velocity and maintained relative humidity, potential evaporation and soil moisture at higher levels than in nonirrigated areas.
W79-01540

THE WEST BRANCH SHABAKUNK CREEK: A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., and A. W. McIntosh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 264, Price codes: A03 in paper copy, A01 in microfiche. Partial Technical Completion Report, August 1978. 47 p, 16 fig, 10 tab, 8 ref. OWRT A-048-NJ(3). 14-34-0001-8032.

Descriptors: *Water pollution, *Environmental effects, Water quality, Erosion, Flood plain management, Bank erosion, Urban drainage, *Stream surveillance, *Biological health of streams.

Streams in urbanizing areas are subject to a variety of stresses produced by the processes of growth; most of the resulting changes are environmentally adverse. Unfavorable conditions may be improved by various government programs, such as flood control and water pollution control. However, before remedial programs can be adopted, the problems and the processes which create them must be understood. Water quality and discharge of the larger rivers are monitored by a network of USGS/State gaging stations. However, small streams are so numerous, and conditions in them change so rapidly that conventional monitoring networks cannot deal with them. Moreover, the condition of such streams is more accuractely monitored by biological evaluations than by measurements of the usual water quality parameters. Therefore, a stream surveillance program has been devised to evaluate the biological health of streams, the pollution sources to which it is subject, and certain other physical conditions relevant to management. These include symptoms of stream

encroachment, channel erosion or filling, and obstruction to flow, either natural or artificial.
W79-01543

FUNGAL DEGRADATION OF ANAEROBICALLY DIGESTED SEWAGE SLUDGE,
Auburn Univ., AL.
For primary bibliographic entry see Field 5E.
W79-01547

METAL CONCENTRATIONS (AS, CD, CU, PB AND ZN) IN SHORTHORN SCULPINS, MYOXOCEPHALUS SCORPIUS (LINNAEUS) AND ARCTIC CHAR, SALVELINUS ALPINUS (LINNAEUS), FROM THE VICINITY OF STRATHCONA SOUND, NORTHWEST TERRITORIES,
British Columbia Research Council, Vancouver.
For primary bibliographic entry see Field 5B.
W79-01552

BIOLOGICAL ASSESSMENT OF WATER QUALITY IN A LARGE RIVER SYSTEM: AN EVALUATION OF A METHOD FOR FISHES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-01553

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 11. NATURAL AREAS OF THE LAKE MICHIGAN DRAINAGE BASIN AND ENDANGERED OR THREATENED PLANT AND ANIMAL SPECIES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 6G.
W79-01555

STUDIES ON THE DECOMPOSITION OF ALLOCHTHONOUS DETRITUS IN TWO SOUTHERN CALIFORNIA STREAMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5B.
W79-01588

ANALYSIS OF CURRENT LAND-USE AND ZONING VERSUS SELECTED ENVIRONMENTAL FACTORS IN DRAINAGE BASINS CONTAINING LAKES OR PONDS,
Eastern Connecticut State Coll., Willimantic.
For primary bibliographic entry see Field 2H.
W79-01589

A PRELIMINARY ECOLOGICAL SURVEY OF DARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
Arkansas Water Resources Research Center, Fayetteville.
For primary bibliographic entry see Field 6G.
W79-01591

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A), APPENDIX A: IN SITU EXPERIMENTS ON THE DISSOLVED AND COLLOIDAL STATE OF IRON IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings.
Publication No. 016440-7-T, December 1975. 2 fig, 3 tab, 25 ref. AT(11-1)-1771.

Descriptors: *Iron, *Bogs, *Lakes, Acidic water, Colloids, Particle size, Dissolved solids, *Michigan, Meromixis, Oxidation, Epilimnion, Hypolimnion, Methodology, Analytical techniques, Tracers, Filtration, Dialysis, *North Gate Lake(MI), Bathyophenanthroline.

Iron compounds in the epilimnion and hypolimnion of acid bog North Gate Lake, Gogebic County, MI, were fractionated and characterized to assess effects of oxidizing and reducing environments on potential colloidal organic matter (COM)- iron complexation. North Gate Lake, pH 4-5 is a small, highly stained, meromictic bog lake with a surface area of about 0.4 ha and a maximum depth of 8 m. The open water is surrounded by a Sphagnum mat. Iron fractions were chemically separated by reactivity to bathyophenanthroline (BPN) after specific digestion procedures, and physical separation was accomplished by means of a plastic anaerobic in-situ filtration sampler (450 nm), and in-situ dialysis (4.8 nm). Three sizes were isolated particulate, colloidal, and dissolved. Colloidal-size reactive ferric iron predominated in the oxygenated epilimnion, while dialyzable or dissolved ferrous iron increased with depth. Organic matter was present in a nontransient colloidal state. Inorganic nonreactive iron species such as Fe(OH)3 comprised only a small fraction of total iron, unlike pH 6-8 lakes. In acid bog lakes, ferric iron is not colloidal as an inorganic complex, OH(-), but colloidal as reactive Fe(+3) by complexation with the colloidal organic acids. After thermally-induced mixing with anaerobic waters, ferric iron is reduced and dissolved. The presence of a residual ferrous organic complex is suggested, however, by the fact that some of the BPN-reactive iron remains colloidal. (See also W78-02510) (Lynch-W sconsin)
W79-01597

NUTRIENT CYCLING AND PRODUCTIVITY OF DYSTROPHIC LAKE-BOG SYSTEMS (PART A) APPENDIX B: THE INFLUENCE OF COLLOIDAL ORGANIC MATTER (COM) UPON IRON AND IRON-PHOSPHORUS CYCLING IN AN ACID BOG LAKE,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings, and F. F. Hooper.
Publication No. 016440-7-T, December 1975. 6 tab, 26 ref. AT(11-1)-1771.

Descriptors: *Iron, *Phosphorus, *Bogs, *Cycles, *Lakes, *Michigan, Nutrients, Acidic water, Colloids, Organic matter, Meromixis, Dialysis, Filtration, Tracers, Stratification, Dissolved solids, *North Gate Lake(MI), Bathophenanthroline.

The influence of yellow colloidal organic matter (COM) on iron-phosphorus associations in a bog lake, and indirect consequences of this interaction, are described. The study was conducted in a small, acid meromictic bog lake, North Gate Lake, Gogebic County, MI, which has a surface area of about 0.4 ha and a maximum depth of 8 m; the open water is surrounded by a Sphagnum mat. Mechanical separation of particulate, colloidal, and dissolved forms of iron and phosphorus from water was made by filtration and dialysis. Bathophenanthroline (BPM) was used for measuring ferrous iron. Mixing in the lake occurs only to a depth of 5-6 m, leaving a monimolimnion which is never oxygenated below 6.5-7.0 m. The 5-m depth is usually anaerobic, while the 2-m depth alternates between very low oxygen and anaerobic conditions. The surface is always oxygenated, but only at 50-70% saturation. BPN-reactive ferrous iron existed in true solution in the anaerobic monimolimnion, whereas in the aerobic epilimnion reactive ferric iron was colloidal. Intermediate depths contained two BPN-reactive forms of ferrous iron--dialyzable Fe(+2) and colloidal Fe(II), which may be present as a COM-Fe(+2) complex. COM concentration had important effects on dialyzable Fe(+2) and dialyzable orthophosphate in anaerobic strata prior to aeration, and appeared to mask cationic properties of colloidal ferric iron and to retard formation of nonreactive Fe(III). (See also W78-02510) (Lynch-Wisconsin)
W79-01598

IMPACT OF RESIDUAL BIOSOLIDS ON RECEIVING WATER QUALITY,
H. S. Costa, D. L. Borton, and J. J. McKeown.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 57-62. 1 fig, 15 ref, 1 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Water quality, *Aquatic life, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Suspended solids, Fish, Aquatic insects, Food chains, Bottom sediments, Biological treatment, Aquatic animals, Pollutants.

A review is presented of studies undertaken by the U.S. pulp and paper industry to determine the impact of nonsettleable solids of biological treatment origin on the aquatic community and their fate in receiving waters. At levels occurring in receiving waters, nonsettleable solids do not generate detectable benthic deposition, do not harm fish raised in their presence, and do not alter the composition of the aquatic insect community. Nonsettleable solids are shown to enter the food chain by ingestion and incorporation into cellular material of aquatic insects. The questions raised regarding the significance of their presence in the environment seem to have been satisfactorily answered and the need for control technology beyond that already achieved is not evident. (Swichtenberg-IPC)
W79-01609

CHARACTERISTICS AND USE OF NONSETTEABLE SOLIDS BY AN AQUATIC FOOD CHAIN ORGANISM,
Institute of Paper Chemistry, Appleton, WI.
E. Zanella, J. Conkey, and M. Tesmer.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 157-163. 1 fig, 1 illus, 7 ref, 7 tab.

Descriptors: *Pulp wastes, *Food chains, *Suspended solids, *Aquatic life, Effluents, Wastes, Industrial wastes, Water pollution sources, Activated sludge, Aerated lagoons, Air, Oxygen, Clays, Caddisflies, Insects, Aquatic insects, Foods, Larvae, Daphnia, Zooplankton, Pulp and paper industry.

Studies conducted at the Institute of Paper Chemistry (Appleton, Wisconsin) showed that nonsettleable solids discharged from oxygen-activated and air-activated sludge and aerated lagoon effluent treatment systems were 40-65% biological in nature of which between 5 and 35% was viable. Viability was greater in summer than in winter samples, with the largest variation evident for the aerated lagoon treatment system. Nonbiological material included inorganic clay and coating materials. The great majority of particles were less than 2 micrometers in diameter and represented 35-58% of the volume. The total range of particle sizes spanned 1-16 micrometers. The nonsettleable solids were used as food by large caddis fly (Hydropsyche walkeri) larvae, however, smaller larvae were unable to utilize these materials. Daphnia sp., a common filter-feedng zooplankton, also demonstrated the ability to utilize nonsettleable solids as an adequate food source. (Swichtenberg-IPC)
W79-01617

BIOLOGICAL IMPACT OF VARIOUS CHLORINATED PHENOLICS AND RELATED COMPOUNDS ON DAPHNIA MAGNA,
State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
P. R. Durkin.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 165-169. 16 ref, 2 tab.

Descriptors: *Bleaching wastes, *Water pollution effects, *Daphnia, Wastes, Industrial wastes, Pulp and paper industry, Pulp wastes, Lethal limit, Daphnia magna, Aquatic animals, Aromatic compounds, Organic compounds, Toxicity, Water pollution sources, Phenols, Equations, Zooplankton.

Acute lethal and sublethal responses in Daphnia magna were used to evaluate the toxicity of methoxy-substituted aromatic model compounds of the toxic components of kraft bleach plant effluents, viz., spent chlorination liquor. A series of chlorinated methylcatechols, methylveratroles, and methylguaiacols were selected for study. Quantitative

chemical structure vs. biological activity correlations were made between both acute lethal and bradycardic potencies and aromatic substituent constants, viz., the lipophilic, the electron field and resonance, and molar refractivity parameters. Both types of biological responses could be described by a general equation giving correlation coefficients of more than 0.9. However, structure vs. activity equations using fewer parameters suggested that the relationship between bradycardia and lethality was incidental rather than intrinsic. The relevance of these findings to the toxicity of kraft bleachery effluents is discussed. (Swichtenberg-IPC)
W79-01618

DISTRIBUTION AND PRODUCTION OF SAGO PONDWEED (POTAMOGETON PECTINATUS L.) ON A NORTHERN PRAIRIE MARSH,
Delta Waterfowl Research Station, Portage la Prairie (Manitoba).
For primary bibliographic entry see Field 2I.
W79-01629

A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
K. R. Dixon, and J. A. Kadlec.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 024, Price codes: A05 in paper copy, A01 in microfiche. February, 1975. 66 p, 15 fig, 3 tab, 69 ref.

Descriptors: *Wetlands, *Mathematical model, *Sewage, *Biomass, Model studies, Forecasting, Time series analysis, Biodegradation, Waste water disposal, Productivity, Litter decomposition.

A mathematical model of the organic components of a wetland ecosystem is developed and analyzed. The objective of the model is to be able to forecast the effects of sewage wastewater disposal on the ecosystem; this requires that the variables of water and nutrients be included in the models of the several processes which may be affected by the wastewater disposal. Components of the ecosystem are vascular plants, standing dead biomass, stem and leaf litter, and soil. The model consists of a set of first-order, nonlinear differential equations representing the mass balance of the biomass components of the system. Its analysis indicated the model's credibility as a first-time model that can be used as an aid in making decisions about the feasibility of using a wetland ecosystem for wastewater disposal. (Steiner-Mass)
W79-01643

WETLAND PLANT COMMUNITIES ALONG THE EASTERN SHORELINE OF LAKE ONTARIO,
State Univ. of New York at Syracuse. Dept. of Forest Botany.
For primary bibliographic entry see Field 2I.
W79-01644

COMBINED TEMPERATURE-SALINITY EFFECTS ON GRASS SHRIMP,
California Univ., Davis. Dept. of Land, Air and Water.
S. Khorram, and W. W. Knight.
ASCE, Journal of the Environmental Engineering Division, Vol. 103, No. EE3, Proc. Paper 12970, June 1977, p 381-388. (California Water Resources Center Project UCAL-WRC-W-243).

Descriptors: *Bioassay, *Deltas, Environmental engineering, *Estuaries, Hydrology, Runoff, *Salinity, *Shrimp, *Temperature, Water distribution, Water pollution, Water quality, Water supply, *California, *San Pablo Bay(Calif).

Standard (Sprague) static bioassay tests were used to determine the effects of temperature, salinity, and their interaction on grass shrimp (Crangon franciscorum) survival after 24 hr, 48 hr, 72 hr, and 96 hr exposure periods. All test organisms were collected from San Pablo Bay, California. Temperature and salinity had highly significant effects on survival and responses to changes in temperature and salinity were strongly interdependent. The optimal ranges of temperature and salinity for 90% survival at 96 hr were 14.5C to 17.0C and 18% to 20%. These values fall within the environmental fluctuations of the test organism's natural habitat. These results are in agreement with values reported for similar crustaceans. The interaction between effects of temperature and salinity appear to be an apparent inherent property of organisms. (Snyder-Calif, Davis)
W79-01645

LOUISIANA METROPOLITAN WETLANDS: A PLANNING PERSPECTIVE, A REPORT TO THE LOUISIANA STATE PLANNING OFFICE,
New Orleans Univ., LA. Urban Studies Inst.
For primary bibliographic entry see Field 6B.
W79-01650

FILTER-FEEDING ETHOLOGY OF BENTHIC INVERTEBRATES (ASCIDIANS). V. INFLUENCE OF TEMPERATURE ON PUMPING, FILTRATION, AND DIGESTION RATES AND RHYTHMS IN PHALLUSIA MAMILLATA,
Paris-6 Univ (France). Lab. Arago.
A. F. Medioni.
Marine Biology, Vol. 48, p 251-259, 1978. 4 fig, 5 tab, 17 ref.

Descriptors: *Water temperature, *Digestion, *Filtration, Benthic fauna, Invertebrates, Animal physiology, Animal metabolism, Seasonal, Currents(Water), Food habits, Animal behavior, *Ascidians, *Phallusia, Filter feeding, Invertebrates.

The influence of temperature has been studied simultaneously on the pumping, filtration, and digestion rates of Phallusia mammillata. Eighteen experiments were made between 7 and 25C on 5 individuals. As for pumping, maximum values were observed at 15C decreasing with lower and higher temperatures, such decreases being more marked at the higher temperatures. The filtering efficiency was fairly consistent throughout an experiment; the pumping and filtration curves were in fact almost parallel. The filtering efficiency of the branchial sac was high, with constant values at 10 and 15C; it became smaller at 20C, with a higher coefficient of variation. The digestion rate also displayed maximum values at 15C. It was lower at 10C and reached its minimum at 20C. The higher temperature affected the percentage of food utilization, which showed smaller values at 20C than at 10C and 15C. (EIS-Deal)
W79-01653

EFFECTS OF TURBIDITY AND SUSPENDED MATERIAL IN AQUATIC ENVIRONMENTS, LITERATURE REVIEW,
Wisconsin Univ., Stevens Point. Dept. of Biology; and Louisiana State Univ., Baton Rouge. Dept. of Zoology and Physiology.
E. M. Stern, and W. B. Stickle.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-056 035, Price codes: A06 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss. Technical Report D-78-21, June 1978. 118 p, 3 tab.

Descriptors: *Turbidity, *Suspended solids, *Suspended load, *Aquatic environment, *Environmental effects, *Bibliographies, *Reviews, *Dredged material disposal.

Literature review of the effects of turbidity and suspended material in aquatic environmentas covering: definitions, units of measure, and methods of measurement; origins; and effects in aquatic environments. Turbidity, regardless of the multiplicity of definitions, units of measure, and methods of measurement, is an expression of the optical properties of water that cause light to be scattered and absorbed rather than transmitted in a straight line. Turbidity is not the same as silation, although the terms have been used synonymously in the past. The literature indicates that turbidity and suspended solids conditions typically created by most dredging and disposal operations are of short duration and are unlikely to produce severe and irreversible ecological effects: possible exceptions to this generalization are coral reefs and other communities especially sensitive to turbidity. Any possible effects of turbidity and suspended material in aquatic environments may be further minimized by careful selection of disposal sites; keying operations to seasonal cycles in biological activity; and special consideration of areas that serve as nursery grounds. (WES)
W79-01656

USE OF DREDGED MATERIAL ISLANDS BY COLONICAL SEABIRDS AND WADING BIRDS IN NEW JERSEY,
Manomet Bird Observatory, MA.
For primary bibliographic entry see Field 5E.
W79-01658

A COMPARISON OF PLANT SUCCESSION AND BIRD UTILIZATION ON DIKED AND UNDIKED DREDGED MATERIAL ISLANDS IN NORTH CAROLINA ESTUARIES,
North Carolina Univ. at Wilmington. Dept. of Biology.
J. F. Parnell, D. M. DuMond, and R. N. Needham.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-056 000, Price codes: A09 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-9, May 1978. 286 p, 4 append, 57 tab, 32 fig, 58 ref. Also designated as University of North Carolina at Wilmington Contribution in Marine Sciences no. 797.

Descriptors: *Birds, *Estuaries, *Islands, *Plant populations, *North Carolina, *Succession, *Dredged material, *Waste disposal sites.

Compares plant succession and bird utilization on diked and undiked dredged material islands in North Carolina estuaries. After a site is diked, deposition of dredged material may be delayed for several years or it may occur immediately. Unfilled diked islands that were studied had a complex topographic zonation. Plant succession was highly variable on these unfilled sites, with topography, substrate particle size, and availability of water being major causative factors. Plant succession on diked and filled sites was similar to that on undiked islands except that dikes tended to vegetate more quickly than did the deposits on outer portions of undiked sites. Only the least and gull-billed terns were found nesting predominantly on diked sites, with most nesting gulls and terns locating the majority of their breeding colonies on undiked sites. Habitat diversity is expected to decrease on mature diked islands as such sites continue to receive dredged material. Such mature islands will likely not be as suitable for nesting colonial birds as either undiked or young diked islands. It is recommended that diking not be used on islands heavily used by nesting waterbirds or wading birds. (WES)
W79-01659

PRELIMINARY EVALUATION OF THE WATER QUALITY OF PROPOSED TOWANDA LAKE, KANSAS.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5A.
W79-01666

LEAD ACCUMULATION RATES IN TISSUES OF THE ESTUARINE TELEOST FISH, GILICHTHYS MIRABILIS: SALINITY AND TEMPERATURE EFFECTS,
Scripps Inst. of Oceanography, La Jolla, CA.
G. N. Somero, T. J. Chow, P. H. Yancey, and C. B. Snyder.
Archives of Environmental Contamination & Toxicology, Vol. 6, No. 2/3, 1977, p 337-348, 2 fig, 4 tab, 24 ref.

Descriptors: Environmental effects, *Water pollution effects, *Temperature, *Salinity, *Lead, Fish, Estuaries, *Teleosts.

The four environmental variables considered in this work were sea water lead concentration, duration of exposure to lead, salinity, and temperature. Spleen, gills, fins, and intestine were found to accumulate the greatest amounts of lead with liver and muscle accumulating the least. Lead accumulation rate was dependent on both salinity and temperature with fish held at high temperatures accumulating more lead than those held at low temperatures and accumulation rate being inversely proportional to salinity. Decay of lead was observed in tissues possessing a covering of mucus. It was suggested that this was due to a complexing of the lead with mucus and subsequently being lost as the mucus sloughed off. Lead levels continued to rise in fish returned to natural seawater from lead-spiked seawater. (Chilton-ORNL)
W79-01667

TEMPERATURE REQUIREMENTS OF TILAPIA ZILLII,
California Univ., Riverside. Div. of Biological Control.
W. J. Hauser.
California Fish and Game, Vol. 63, No. 4, October 1977, p 228-233, 2 tab, 13 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Temperature, Mortality, Biocontrol, *Cichlids, California, Laboratory tests, On-site investigations, Irrigation canals, Resistance, *Tilapia zillii.

Temperature requirements of the African cichlid, Tilapia zillii which is used for biological control of aquatic weeds were determined through laboratory experiments and field observations. Optimum temperature for feeding, growth and spawning was found to be between 20 and 32C. Water temperatures above 39.5C and below 11.2C resulted in deaths with extreme upper and lower lethal temperature tolerance limits being 42.5C and 6.5C. Field observations showed that survival was lessened with two-week exposures to 13.0C. It was concluded that these temperature requirements lessened the usefulness of the organism as a biological control agent in irrigation canals of southern California. (Chilton-ORNL)
W79-01668

FEEDING AND GROWTH RATES OF POLINICES DUPLICATUS PREYING ON MYA ARENARIA AT BARNSTABLE HARBOR, MASSACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Zoology.
D. C. Edwards, and J. D. Heubner.
Ecology, Vol. 58, No. 6, Autumn 1977, p 1218-1236, 11 fig, 5 tab, 89 ref. NSF-U.R.P. GY7297.

Descriptors: Environmental effects, Temperature, *Feeding rates, *Growth rates, *Snails, *Predation, *Clams, *Massachusetts, *Barnstable Harbor(Mass).

Field observation showed that the major factors affecting feeding rates of the snail Polinices duplicatus eating the clam Mya arenaria were food supply, temperature, and predator size. Food supply studies showed that snails of each size ate similar numbers of prey/time when provided with excess prey of differing sizes. Temperature studies showed that feeding peaked at 0.6 Mya/snail/day in warm months and dropped to zero for 4 months in cold months. Larger predators consistently ate larger prey than did smaller ones with 4th-yr. snails ingesting 385 kilojoules/yr and 2nd-yr snails ingesting approximately 218 kJ/yr. Growth rates were correlated more with a snails age than its size. 2nd-yr snails grew nearly 3-fold in diameter while 4th-yr snails grew only 1.2-fold. (Chilton-ORNL)
W79-01669

TOXICITY OF INTERMITTENT CHLORINATION TO FRESHWATER FISH: INFLUENCE OF TEMPERATURE AND CHLORINE FORM,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
A. G. Heath.
Hydrobiologia, Vol 56, No 1, 1977, p 39-47, 7 fig, 6 tab, 19 ref.

Descriptors: Environmental effects, *Chlorination, *Temperature, *Water pollution effects, Thermal pollution, Fish, *Toxicity, Freshwater, Rainbow trout, Salmon, Carp, Shiners, Channel catfish, *Chlorine.

Bioassay results showed that temperature has relatively little effect on the lethal concentrations of either free chlorine or monochloramine to Salmo gairdneri, Oncorhynchus kisutch, Notemigonus crysoleucas, Cyprinus carpio and Ictalurus punctatus when the exposure is delivered intermittently. This conclusion should not necessarily be extended to conditions where a constant chlorine concentration is used. A greater toxicity to free chlorine compared to monochloramine was found. S. gairdneri, O. kisutch, and I. punctatus were the most sensitive to both types of chlorine with C. carpio bein most resistant and N. crysoleucas being intermediate in sensitivity. (Chilton-ORNL)
W79-01670

CONSEQUENCES OF PERIODIC APPLICATIONS OF COPPER SULFATE AND SIMAZINE FOR PHYTOPLANKTON CONTROL IN CATFISH PONDS,
Auburn Univ., AL. International Center for Aquacultures.
C. S. Tucker, and C. E. Boyd.
Transactions of the American Fisheries Society, Vol 107, No 2, March 1978, p 316-320, 5 fig, 1 tab, 22 ref.

Descriptors: Environmental effects, *Water pollution effects, Population, Density, Aquatic populations, *Phytoplankton, *Copper sulfate, Toxicity, *Simazine.

Phytoplankton density as estimated from chlorophyll a concentrations and total counts of phytoplankton was initially lower in ponds treated with copper sulfate than in control ponds but steadily increased over a three month period to a point where density was comparable in control ponds and ponds treated with copper sulfate. Phytoplankton density was greatly depressed in ponds treated with simazine but simazine applications over an extended period resulted in low dissolved oxygen concentrations which caused decreased fish yields and poor conversion ratios. Fish yield and conversion ratios were not affected by copper sulfate treatment. (Chilton-ORNL)
W79-01672

CHARACTERIZATION AND REUSE OF ASH POND EFFLUENTS IN COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Chattanooga.
T. Y. J. Chu, R. J. Ruane, and P. A. Krenkel.
Journal of the Water Pollution Control Federation, Vol 50, No 11, November 1978, p 2494-2508, 13 fig, 5 tab, 16 ref.

Descriptors: *Water pollution effects, *Powerplants, Effluents, Fly ash, Water quality, Ponds, Settling basins.

Characteristics of ash sluicing water were found to vary. The main factors affecting the variation were the source of the coal, method of firing, quantity and quality of sluicing water, efficiency of fly ash collecting methods, and performance of the settling ponds. The pH pond discharges was primarily influenced by calcium and sulfate concentrations in effluents from pulverized coal plants, method or firing and buffering capacity of raw water used for sluicing. Concentrations of suspended solids in the discharges appeared to be influenced by cenospheres. Twelve schemes for reuse of ash pond effluents were presented- four or these (complete reuse of bottom ash sluicing water, reuse of combined ash sluicing water for make-up water in SO2 scrubbers, complete reuse of both bottom and fly ash sluicing waters, and recycling of combined ash sluicing water with treatment of blowdown prior to discharge to a stream) in detail. Use of mathematical models was employed in the studies to represent the water balance applicable to the twelve combinations of schemes. (Chilton-ORNL)
W79-01674

ZOOBENTHOS IN THERMAL DISCHARGE TO WESTERN LAKE ERIE,
Michigan State Univ., East Lansing.
R. A. Cole, and J. E. Kelly.
Journal of the Water Pollution Control Federation, Vol 50, No 11, November 1978, p 2509-2521, 10 fig, 4 tab, 30 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Benthos, *Zooplankton, *Cooling water, Discharge(Water), Lake Erie.

This 5 year study of benthic macroinvertebrates in and near a once through cooling system included sampling of zoobenthos, oxygen concentration, temperature, sedimentary particle size, carbon and nitrogen. Zoobenthos were primarily tubificids and chironomids. Benthic abundance and sedimentary nitrogen and carbon were positively correlated with the percentage of silt and clay in the sediment. Abundance, diversity and mean individual size of benthos declined in the discharge canal and an adjacent heated area. This decline in abundance and diversity were related to intense fish use of the thermal discharge. Increased abundance and mean size in the river appeared to be response to changes in water quality resulting from pumping of well oxygenated lake water through the degraded river channel. (Chilton-ORNL)
W79-01675

POWER PLANT COOLING WATER CHLORINATION IN NORTHERN CALIFORNIA,
California Univ., Berkeley.
S. J. Hergott, D. Jenkins, and J. F. Thomas.
Journal of the Water Pollution Control Federation, Vol 50, No 11, November 1978, p 2590-2601, 11 fig, 3 tab, 16 ref.

Descriptors: *Water pollution effects, *Powerplants, *Chlorination, *Cooling water, *California, Chlorine.

Chlorination frequency varied among five power plants in Northern California from one per week to four per day and duration of chlorination from 15-40 minutes per cycle. Oxidant residual determined at condenser inlets was the criterion used to determine chlorine dose level. As a result of more precise measurements of residuals throughout the system, the chlorine dose was reduced to produce a residual of 0.5 mg C12/l at the condenser inlets. Results of in-plant studies and of decay and receiving water studies at each of the five power plants (Contra Costa, Pittsburg, Potrero, Hunters Point, and Moss Landing) are detailed. (Chilton-ORNL)
W79-01676

SEASONAL DYNAMICS OF CU2+, ZN2+, CA2+, AND MG2+ IN GONADS AND LIVER OF WINTER FLOUNDER (PSEUDOPLEURONECTES AMERICANUS): EVIDENCE FOR SUMMER STORAGE OF ZN FOR WINTER GONAD DEVELOPMENT IN FEMALES,
Memorial Univ. of Newfoundland, St. John's. Marine Science Research Lab.
G. L. Fletcher, and M. J. King.
Canadian Journal of Zoology, Vol 56, No 2, February 1978, p 284-290, 3 fig, 1 tab, 24 ref.

Descriptors: Environmental effects, *Seasonal, Copper, Zinc, Calcium, Magnesium, Fish, Reproduction, Water pollution effects.

Feeding activity in flounder occurred from April through October during each year of the study (1972-1976). Measurement of metals deposited in the gonads indicated that substantially more Zn,

Cu, and Ca are deposited in the ovaries than in the testes and more Mg accumulated in the testes. Male gonads increased to approximately 16% of body weight in November and then declined to 10% of body weight by January. Ovaries increased to approximately 16% of body weight by February. Ovulation and spawning occurred in June. Ovaries continued to incorporate all four metals after the fish had stopped feeding. It was concluded that Zn and Cu requirements could have been released from the liver or other storage areas within the fish and that Cu, Ca, and Mg could have been absorbed from seawater. (Chilton-ORNL)
W79-01677

EFFECT OF ENVIRONMENTAL TEMPERATURE ON BIOSYNTHESIS OF LIVER PHOSPHATIDYL-CHOLINE IN THE TROUT (SALMO GAIRDNERID),
Lyon-1 Univ., Villeurbanne (France). Lab. de Physiologie Generale et Comparee.
G. Zwingelstein, N. A. Malak, and G. Brichon.
Journal of Thermal Biology, Vol 3, 1978, p 229-233, 4 tab, 27 ref.

Descriptors: Environmental effects, *Thermal pollution, Fish, *Trout, Lipids, Temperature, Biochemistry, *Water pollution effects.

The data demonstrate that the alteration in fatty acid composition of trout liver phosphatidyl-choline in response to environmental temperature reflects the differences in molecular species biosynthesis. Incorporation of P32 was found to take place more rapidly in the molecular species with high degree of unsaturation. Trout acclimated to 11 and 21C showed that temperature acclimation did not change the relative proportions of label shown in the five subfractions. Incorporation of C14-methyl-choline also took place more rapidly in unsaturated molecular species but it was found that increases in incubation temperature resulted in a decrease in the proportion of label in the unsaturated fractions. (Chilton-ORNL)
W79-01680

TEMPERATURE ADAPTATION IN THE FRESHWATER SNAIL, HELISOMA TRIVOLVIS (SAY),, IN AN ARTIFICIALLY HEATED RESERVOIR IN THE SOUTHEASTERN UNITED STATES,
Savannah River Ecology Lab., Aiken, SC.
D. H. Wood.
Journal of Thermal Biology, Vol 3, 1978, p 187-194, 7 fig, 2 tab, 18 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Snails, Temperature, Growth rates, Reproduction, Respiration, *South Carolina, Southeast US, Reservoirs.

Snails from an unheated area and from an area heated to 5C above normal by discharges from a nuclear production reactor were compared. Variation in metabolic-temperature responses was observed between animals from heated and unheated areas as well as between summer and winter generations. Snails from both areas produced three annual generations and spawning was synchronous except for a shorter mid-summer spawn in the heated area. Seasonal patterns of change in growth rates and in body weight relative to shell size were similar in the two areas. It was concluded that metabolic compensation is accompanied by homeostasis in other rate functions and can serve as indicators of present thermal adaptability but that they cannot give a complete indication of longterm adaptability because such patterns may change over an intermediate time span. (Chilton-ORNL)
W79-01681

OLISTHODISCUS LUTEUS (CHRYSOPHYCEAE) I. EFFECTS OF SALINITY AND TEMPERATURE ON GROWTH, MORTILITY AND SURVIVAL,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
C. R. Tomas.
Journal of Phycology, Vol 14, No 3, September 1978, p 309-313, 5 fig, 1 tab, 31 ref.

Descriptors: Environmental effects, *Temperature, *Salinity, Phytoplankton, *Mortality, *Growth rates, Water pollution effects.

At a salinity range of 2-50%, O. luteus showed an increased tolerance to low salinities at higher temperatures. Growth response at low salinities and higher temperatures showed that sizable populations could be attained at 5%. At 5-50% salinity, variable but distinct optima for density, growth and motility were seen at 5, 10 and 30C. At lower salinities and temperatures, loss of mortality occurred. Loss of motility accompanied by low division rates appears to be partially responsible for reduced abundance under these environmental conditions. (Chilton-ORNL)
W79-01682

THE EFFECT OF TEMPERATURE AND BODY SIZE ON ELECTRON TRANSPORT SYSTEM ACTIVITY IN FRESHWATER ZOOPLANKTON,
Canada Centre for Inland Waters, Burlington (Ontario); and National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
U. Borgmann.
Canadian Journal of Zoology, Vol 56, 1978, 634-642, 3 fig, 6 tab, 25 ref.

Descriptors: Environmental effects, *Seasonal, *Temperature, *Zooplankton, Freshwater, Oxidation, Reduction(Chemical), Size, Water pollution effects.

The rate of cytochrome c reduction by NADH, succinate, and NADPH in Mysis relicta, Limnocalanus macrurus, and surface zooplankton was measured as a means of determining electron transport system activity. No seasonal variation in reaction rates was observed for Mysis of Limnocalanus but activity in surface zooplankton was significantly higher for NADH and succinate oxidation in samples collected between March and May when surface temperatures ranged from 1.3 to 9.6C than in samples collected when surface temperatures were 22-24C. Larger organisms were found to have lower activity per unit weight than did smaller organisms. It was suggested that, since the effects of temperature and size are similar for NADPH oxidation and NADH or succinate oxidation, the ratio of NADPH to either NADH or succinate oxidation might be a useful indicator of exposure to toxic organic compounds. (Chilton-ORNL)
W79-01683

THE EFFECTS OF SHORT AND LONG TERM TEMPERATURE STRESS ON SEROTONIN, DOPAMINE AND NOREPINEPHRINE CONCENTRATIONS IN MOLLUSCAN GANGLIA,
East Coast Neuroscience Foundation, Inc., New York.
G. B. Stefano, L. Hiripi, and E. J. Catapane.
Journal of Thermal Biology, Vol. 3, 1978, p 79-83, 2 fig, 32 ref.

Descriptors: Environmental effects, *Thermal pollution, Seasonal, Temperature, *Mollusks, *Thermal stress, Water pollution effects, *Monoamines, Central nervous system.

Serotonin, dopamine and norepinephrine concentrations of the central nervous system were determined on groups of Mytilus edulis and Anodonta cygnea which had been acclimated to either cold (5C) or warm (17 or 20C) temperatures and then subjected to temperatures of 5, 17 or 20, 28C. Monamine metabolism was shown to be modified during temperature acclimation in both bivalves. Cold stress significantly reducedserotonin levels in both organisms over a long term period. As a result of cold stress dopamine significantly increased after 12 h and remained elevated in both organisms. As a result of warm stress dopamine levels rose in M. edulis only at the 10 day reading. Norepine-phrine levels increased over the short term period in both organisms as a response to both cold and heat stress. (Chilton-ORNL)
W79-01684

THE INFLUENCE OF CONSTANT AND CYCLIC ACCLIMATION TEMPERATURES ON THE METABOLIC RATES OF PANOPEUS HERBSTII AND UCA PUGILATOR,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
R. F. Dame, and F. J. Vernberg.
Biological Bulletin, Vol. 154, April 1978, p 188-197, 4 fig, 3 tab, 21 ref. NSF GA-36915.

Descriptors: *Environmental effects, *Temperature, *Crabs, Energy budget, Respiration, *Metabolism, Cycles, Water pollution effects, Cyclic temperatures, Constant temperatures.

Experimental data showed that the metabolic rate of the organisms studied was influenced differently by constant and cyclic temperature acclimation regimes. In Panopeus the most significant difference occurred in the 15-25C cycle. Crabs exposed to this cycle had a lower metabolic rate than animals exposed to a constant temperature of 25C. Respiratory responses of Uca to increasing cyclic temperature acclimation time were different than those of Panopeus and were highly variable. It was suggested that these organisms utilize energy more efficiently when subjected to natural cyclic temperature conditions than when subjected to constant temperature environments and that this difference in metabolic data would be significant in analyzing the role of yearly energy budgets in ecosystem energetics. (Chilton-ORNL)
W79-01685

VERTEBRAL VARIATION IN ZEBRAFISH (BRACHYDANIO RERIO) RELATED TO THE PREFERTILIZATION TEMPERATURE HISTORY OF THEIR PARENTS,
Manitoba Univ., Winnpeg. Dept. of Zoology.
W. Dentry, and C. C. Lindsey.
Canadian Journal of Zoology, Vol 56, 1978. p 280-283, 1 fig, 9 ref.

Descriptors: Environmental effects, *Thermal pollution, Temperature, Fish, Reproduction, Breeding, Fish genetics, Water pollution effects, *Zebrafish, Parental temperature history, Vertebral count.

Experimental results indicated that in offspring reared at the same temperature and produced by the same parents, vertebral counts differed depending upon the temperature at which the parents were being held at the time of laying. In all cases where differences between pairs were significant, vertebral count was higher in the sample originating from the higher parental holding temperature. It was concluded that even though interpretation of these results is complicated by differences among thermal responses of different breeding pairs, the existence of a parental temperature history effect on offspring vertebrae is strongly indicated and that such an effect should be looked for in other species of fish. (Chilton-ORNL)
W79-01687

SOME EFFECTS OF PHOTOPERIOD, TEMPERATURE, AND FOOD ON EMERGENCE IN THREE SPECIES OF CHIRONOMIDAE (DIPTERA),
Brock Univ., St. Catherines (Ontario). Dept. of Biological Sciences.
H. V. Danks.
The Canadian Entomologist, Vol 10, No 3, March 1978, p 289-300, 6 fig, 3 tab, 30 ref.

Descriptors: Environmental effects, *Temperature, *Diptera, Larvae, *Photoperiodism, *Food abundance, Water pollution effects.

Newly hatched larvae of Chironomus decorus, Endochironomus nigricans, and Chironomus staegeri were reared to adulthood at 15 and 20C and 16 and 8 h daily photoperiods. C. decorus required 26 days at 20C and 37 days at 15C for normal development to EM50; E. nigricans required 35 days at

20C and 48 days at 15C; and C. staegeri required 68 days at 20C. Emergence was inhibited in 8 h daily photoperiods at both temperatures for E. nigricans and C. staegeri and at 15C for C. decorus. Some few individuals emerged even under these adverse conditions. It was suggested that small percentages of atypical individuals might buffer populations in years of unusual environmental conditions. Moderate reduction of food did not appear to greatly alter the initial emergence pattern compared with fully fed chambers, but it did delay the development of some individuals and increased mortality. (Chilton-ORNL)
W79-01688

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. VIII. SUMMARY OF RESULTS,
Woods Hole Oceanographic Inst., MA.
G. D. Grice, and D. W. Menzel.
Marine Science Communications, Vol. 4, No. 1, 1978, p 23-31, 10 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, Bacteria, Plankton, Fish, Copepods, Sediments, Bioassay, Ecosystems.

This paper summarizes the results of previously reported experiments on the reactions to mercury of plankton communities maintained in 1300 cubic meter plastic enclosures for a period of 72 days. A significant decrease in bacterial biomass occurred within one day after addition of mercury followed by a recovery to control levels within 7 days. A similar reduction and recovery was seen in counts of viable colonies of bacteria. Phytoplankton productivity decreased for a period of 12 days following mercury addition. Naupliar copepods were significantly reduced in abundance and showed little signs of recovery for 34 days. Growth of chum salmon was reduced. This appeared to be related to decreased food supply rather than direct effect of mercury. Total mercury concentration in solution and suspension decreased at a rate of about 3%/day during the time of the experiment. 90% was recovered in sediment at the close of the experiment. (Chilton-ORNL)
W79-01691

BACTERIAL AEROSOLS FROM COOLING TOWERS,
Army Dugway Proving Ground, UT.
A. P. Adams, M. Garbett, and B. G. Lewis.
Journal Water Pollution Control Federation, Vol 50, No 10, 1978, p 2362-2369, 4 tab, 30 ref.

Descriptors: Environmental effects, *Water pollution sources, *Air pollution effects, Powerplants, *Cooling water, *Bacteria, Chlorination, *Aerosols.

The Burbank, California municipal electrical generating plant, which uses wastewater effluent for makeup water, was chosen for this study. Samples were taken for analysis at a six month interval. During this time the method of chlorination was switched from gaseous chlorine to chlorine dioxide. Total bacteria counts in the water of the cooling-tower basin differed by a 1000-fold reduction after the use of chlorine dioxide was introduced. A drastic reduction also occurred in the count of the viable bacteria-bearing particles exiting into the air via the cooling-tower vents. It was concluded that the aerosol count of bacterial particles expelled from the cooling tower would offer no significant cause for concern for people downwind of the cooling tower. (Chilton-ORNL)
W79-01694

EFFECTS OF CHLORINATION ON DIFFERENTIATED COLIFORM GROUPS,
Tufts Univ., Medford, MA.
E. C. Kinney, D. W. Drummond, and N. B. Hanes.
Journal Water Pollution Control Federation, Vol. 50, No. 10, 1978, p 2307-2312, 2 fig, 6 tab, 15 ref. Pub. Health 3A04AH 00717-0151.

Descriptors: Environmental effects, *Water pollution effects, *Chlorination, *Bacteria, *Coliforms, Animal growth.

The purpose of this study was to investigate the phenomenon of apparent regrowth of three major coliforma subgroups (Escherichia coli, Klebsiella spp., and Enterobacter-Citrobacter spp.) in a chlorinated wastewater effluent. It was suggested that the mechanism causing the increasing bacterial numbers after chlorination is recovery of damaged cells rathen than growth of surviving cells. It was concluded that the bacterial behavior observed raises doubts about the need for chlorination of a well-treated effluent in which bacterial death occurs without disinfection. Results also suggest that a delayed bacterial analysis of stored samples should be used for the evaluation of the efficiency of the chlorination procedure. (Chilton-ORNL)
W79-01695

UPTAKE OF ZINC BY THE AQUATIC LARVAE OF SIMULIUM ORNATIPES (DIPTERA: NEMATOCERA),
Australian National Univ., Canberra. Dept. of Zoology.
J. G. T. Carter, and W. L. Nicholas.
Australian Journal of Marine and Freshwater Research, Vol. 29, No. 3, June 1978. p 299-309, 3 fig, 4 tab, 16 ref.

Descriptors: *Environmental effects, *Water pollution effects, *Metals, *Zinc, *Diptera, *Absorption, Toxicity, Larvae.

Experimental results showed that S. ornatipes larvae exposed to zinc absorb appreciable amounts of the metal. An increase in calcium ion concentration reduced the toxicity of zinc to the larvae but had no effect on the uptake from high or low concentrations or on the loss of zinc. Fractionation of larvae into cuticle, high- and low-molecular-weight fractions showed that in the cuticle and high-molecular-weight fractions two pools may be identified. In one pool, zinc is weakly held and exchanges rapidly with the zinc in solution. In the other, zinc is held and exchanges slowly. The quantity of zinc entering these pools was influenced by exposure time, temperature and concentration. Data indicated that zinc was bound by phenolic groups in the cuticle fraction and by phosphonic acids in the high-molecular-weight fraction. (Chilton-ORNL).
W79-01696

THE PHOSPHORUS STATUS OF THE SEDIMENTS OF THREE EUTROPHIC LAKES IN VICTORIA,
La Trobe Univ., Bundoora (Victoria). Dept. of Inorganic and Analytical Chemistry.
S. J. E. Slater, and A. J. Boag.
Australian Journal of Marine and Freshwater Research, Vol 29, No 3, June 1978, p 263-274, 2 fig, 4 tab, 23 ref.

Descriptors: Environmental effects, *Water pollution effects, Sedimentation, *Phosphorus, *Lake sediments, *Victoria, Lakes, *Australia.

Sediments from Lakes Burrumbeet, Learmonth, and Colac in Victoria were analyzed for phosphorus, iron, and aluminum. Lake Colac contained the highest levels of all forms of sediment phosphorus (Total P - 378-527 mg/kg, Inorganic P - 353-418 mg/kg, Organic P - 11-173 mg/kg) as well as the greatest potential for the release of dissolved reactive phosphorus to the overlying water. Correlations between the sediment parameters amorphous iron and inorganic phosphorus which have been reported for other lakes were not found to be applicable to the data gathered in this study. (Chilton-ORNL)
W79-01697

STREPTOCOCCUS SP. FROM MARINE FISHES ALONG THE ALABAMA AND NORTHWEST FLORIDA COAST OF THE GULF OF MEXICO,
Auburn Univ., AL. International Center for Aquacultures.
J. A. Plumb, J. H. Schachte, J. L. Gaines, W. Peltier, and B. Carroll.
Trans Am Fish Soc. 103(2), p 358-361, 1974.

Descriptors: *Alabama, Coasts, Fishes, *Florida, *Gulf of Mexico, Marine environment, *Streptococcus sp.

Fish kills in estuarine bays along the Florida and Alabama (USA) Gulf Coast were investigated in August and September 1972. Eight species of moribund fish were examined. A nonhemolytic, group B, type Ib Streptococcus sp. was isolated from over 90% of the fish examined. Parasites and toxicants were eliminated as possible causes of the kills. Copyright 1974, Biological Abstracts, Inc.
W79-01698

THERMAL ACCLIMATION INDUCED COMPENSATION IN BIOCHEMICAL CONSTITUENTS OF THE INDIAN FRESHWATER LEECH, POECILOBDELLA VIRIDIS (BLANCHARD),
Marathwada Univ., Aurangabad (India). Dept. of Zoology.
G. K. Kulkarni, and R. Nagabhushanam.
Hydrobiologia, Vol 58, No 1, 1978, p 3-6, 1 tab, 29 ref.

Descriptors: Environmental effects, *Water pollution effects, *Thermal pollution, *Temperature, Aquatic animals, Biochemistry, *Leeches.

Changes in water, glycogen and protein contents during thermal acclimation (warm and cold) were determined from the whole body tissues of a group of ten leeches. The percentages of water and glycogen both decreased significantly during both acclimation processes and protein percentage increased significantly. The paper includes a discussion on the ecophysiological significance of these changes in counteracting ambient thermal fluxes. (Chilton-ORNL)
W79-01700

STUDIES ON THE MYTILUS EDULIS COMMUNITY IN ALAMITOS BAY, CALIFORNIA: VII. THE INFLUENCE OF WATER-SOLUBLE PETROLEUM HYDROCARBONS ON BYSSAL THREAD FORMATION,
California State Univ., Long Beach. Dept. of Biology.
R. S. Carr, and D. J. Reish.
The Veliger, Vol 21, No 2, October 1978, p 283-287, 3 tab, 14 ref.

Descriptors: Environmental effects, *Water pollution effects, Oil pollution, *Mussels, Organic compounds, *Oil wastes, *California, *Alamitos Bay(Calif).

Mytilus edulis ranging in width from 18 to 23 mm were exposed to varying concentrations (25, 50, 75, and 100%) of the water-soluble fraction (WSF) of No. 2 fuel oil, South Louisiana crude oil and Sta-lube outboard motor oil. Byssal thread production was significantly inhibited at the 100% level for all three oils. South Louisiana crude oil showed the greatest inhibitory influence on a percent WSF basis and Sta-lube the least effect. Significant enhancement of byssal thread formation was observed for all three WSFs at concentrations lower than those at which an inhibitory effect was produced. (Chilton-ORNL)
W79-01701

BDELLOVIBRIO AND THE INTESTINAL FLORA OF VERTEBRATES,
Auburn Univ., AL. Dept. of Microbiology.
For primary bibliographic entry see Field 5F.
W79-01742

MORPHOLOGICAL VARIATION OF ELODEA IN WESTERN MASSACHUSETTS: FIELD AND LABORATORY STUDIES,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.

D. K. Lawrence.
Rhodora, Vol. 78, No. 816, p 739-749, December 1976. 3 tab, 21 ref. OWRT A-042-MASS(3), 14-31-0001-5021.

Descriptors: *Aquatic weeds, *Bioindicators, *Plant morphology, Aquatic plants, Eutrophication, *Massachusetts, Elodea canadensis, Elodea nuttallii.

Elodea canadensis and E. nuttallii have a potential use as indicators of pollution and are economically important plants because of their occurrence as troublesome waterweeds. Due to infrequent and brief flowering periods, leaf morphology (and particularly leaf width) is often used to differentiate these species. A tank experiment was designed to test the effects of elevated temperatures, comparable to those attained in some field situations, on the vegetative morphology of typical E. canadensis. Leaf width was reduced at higher temperatures and leaves were produced which fell within the reported range of E. nuttallii. Accepted taxonomic criteria for distinguishing E. canadensis and E. nuttallii are not satisfactory in determining four of 20 naturally occurring populations sampled in western Massachusetts. (Godfrey-Mass)
W79-01743

THE SPREAD OF SEVERAL INTRODUCED OR RECENTLY INVADING AQUATIC IN WESTERN MASSACHUSETTS,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
C. J. Burk, S. D. Lauermann, and A. L. Mesrobian.
Rhodora, Vol. 78, No. 816, p 727-767, December 1976. 17 ref. OWRT A-042-MASS(4), 14-31-0001-5021.

Descriptors: *Aquatic plants, *Aquatic weeds, Eutrophication, Water pollution effects, Marsilea quadrifolia L. Wolffia columbiana(Karst), Trapa natans L., Cabomba carolininana(Gray), *Massachusetts.

Changes in the distributional status of several recently introduced or invading vascular plant species have been observed during the present century. Water colver, Marsilea quadrifolia L. has become established since 1945 along two miles of the Mill River in Northampton, Massachusetts, and successfully invaded the Arcadia Wildlife Sanctuary marsh during a period of disturbance. Watermeal, Wolffia columbiana (Karst) unknown in the area prior to 1933, is now abundant in highly eutrophic lakes and impoundments which receive sewage effluents. Water chestnut, Trapa natans L. has reached pest densities in Upper and Lower Ponds on the Mount Holyoke College campus in South Hadley and has escaped to form a colony downstream in Stoney Brook. Cooter-grass, Cabomba caroliniana (Gray), first detected in Massachusetts in 1930, has spread to several other western Massachusetts sites and is the dominant submerged aquatic plant life in Lake Rohunta in Franklin and Worcester Counties. Each of these species occurs in sites affected by some form of habitat disruption; none is yet so widespread as to be regularly encountered in freshwater systems. (Lefferts-Mass)
W79-01744

GENETIC DAMAGE TO A FERN POPULATION GROWING IN A POLLUTED ENVIRONMENT: SEGREGATION AND DESCRIPTION OF GAMETOPHYTE MUTANTS,
Massachusetts Univ., Amherst. Dept. of Botany.
E. J. Klekowski, Jr., and E. L. Davis.
Canadian Journal of Botany, Vol. 55, No. 5, p 542-548, 1977, 6 fig, 2 tab, 14 ref. OWRT B-053-MASSZ(3), 14-34-0001-6087.

Descriptors: *Ferns, *Genetics, Water pollution effects, Plant populations, *Riparian plants, Rivers, *Massachusetts, *Osmunda regalis, *Mutants, *Millers River(Mass).

A population of the fern Osmunda regais growing in a polluted river was investigated genetically. Previous studies documeated a high frequency of postzygotically induced genetic and chromosome damage. This paper describes two categories of gametophytic mutants which occurred in the progeny of this population. A gametophyte phenotype which exhibited a maternal effect on the sporophyte generation when it was the female parent occurred in 7.8% of the spore sample. A gametophyte phenotype which could best be characterized as a neuter calluslike mass occurred in 6.6% of the spore sample. Studies of nearby O. regalis populations in non-polluted sites failed to document the presence of such phenotypes in the spore samples. (Godfrey-Mass)
W79-01745

MICROFLORAL RESPONSE TO AQUATIC WEED DECOMPOSITION,
Massachussets Univ., Waltham. Dept. of Environmental Sciences.
J. Rho, and H. B. Gunner.
Water Research, Vol. 12, p 165-170, 1978. 5 fig, 3 tab, 21 ref. OWRT B-058-MASS(1), 14-34-0001-7161.

Descriptors: *Aquatic weeds, *Eutrophication, Microflora, *Aquatic algae, Nutrients, *Decomposing organic matter, Chlorophyta, *Nitrates, *Nitrites, *Phosphates, *Myriophyllum heterophyllum, *Water milfoil.

Microfloral response to the liberation of N and P from decomposing water milfoil tissue (Myriophyllum heterophyllum) was determined under various laboratory conditions. The death and decay of the macrophyte released ammonia and phosphate in concentrations sufficient to promote algal growth. The oxidation of ammonia by resident nitrifiers exercised a striking impact on microflora succession. Nitrification was accompanied by a decrease in pH and thereafter by a decline in the numbers of bacteria and protozoa. Subsequently, coincident with the accumulation of nitrite and nitrate, the numbers of the resident green algal communities rose dramatically. These results, coupled with field observations, indicate that nutrient released by decomposing aquatic weeds and the changes attendant upon nitrification are of significance in the distribution and abundance of aquatic microflora. (Godfrey-Mass)
W79-01746

DISTRIBUTION OF BLUEGREEN ALGAE IN A MISSISSIPPI GULF COAST SALT MARSH,
Mississippi State Univ., Mississippi State. Dept. of Botany.
W. W. Sage, and M. J. Sullivan.
Journal of Phycology, Vol. 14, No. 3, p 333-337, September 1978. 1 fig, 4 tab, 15 ref. OWRT A-099-MISS(3), 14-34-0001-7052.

Descriptors: *Cyanophyta, *Salt marshes, *Soil algae, *Biological communities, *Ecological distribution, Biogeography, Light intensity, Bulrush, *Mississippi, *Graveline Bay Marsh(Miss), Community structure, Schizothrix, Spartina, Juncus, Distichlis.

Edaphic bluegreen algal communities were sampled from five monotypic angiosperm zones in Graveline Bay Marsh near Ocean Springs, Mississippi. Samples and environmental data were taken quarterly from October 1976 to June 1977 beneath the following angiosperms: Distichlis spicata (L.) Greene, Scirpus olneyi Gray, Spartina patens (Aiton) Muhl., S. alterniflora Loisel., and Juncus roemerianus Scheele. Results showed that communities in all five zones of the marsh were dominated by Schizothrix calcicola (Ag.) Gom. throughout the year, while subdominants varied according to season. The number of individuals in all zones was greatest in the summer and lowest in the winter. An examination of the structure of the five edaphic communities indicated a single, nearly homogeneous community exists over the entire surface of the marsh shaded by an angiosperm canopy. Light intensity appears to be the major factor affecting the distribution of bluegreen algae in this salt marsh. The results of this study are in agreement with those conducted in other North Atlantic temperate salt marshes.
W79-01750

THE EFFECTS OF INTERMITTENT CHLORINATION ON COHO SALMON, ALEWIFE, SPOTTAIL SHINER, AND RAINBOW SMELT,
Wisconsin Univ., Milwaukee. Dept. of Zoology; and Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
G. L. Seegert, and A. S. Brooks.
Transactions of the American Fisheries Society, Vol. 107, No. 2, p 346-353, 1978. 4 tab, 20 ref.

Descriptors: *Freshwater fish, *Chlorination, *Shiners, *Smelts, Salmon, Mortality, Water temperature, Water quality, Environmental effects, Lethal limit, Resistance, Laboratory tests, Bioassay, *Coho salmon, *Alewife, Spottail shiner, Rainbow smelt.

Coho salmon, alewife, spottail shiner, and rainbow smelt were exposed for 30 min to residual chlorine. The alewifes were tested at 10, 15, 20, 25, and 30C, the salmon and shiners at 10, 15, and 20C and the smelt at 10C. Thirty minute LC50 values were both species and temperature dependent. All species showed an inverse relationship between test temperatures and LC50 values. Mortalities usually occurred within 24 h after exposure. Except for the 10-C spottail shiner, fish rarely recovered, following loss of equilibrium. Concentrations resulting in no mortality were 0.6-0.7 of the LC50 value. (EIS-Klein)
W79-01753

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS, VOL. I. WORKING GROUP RESULTS,
Sigma Research, Inc., Richland, WA.
R. Goldstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 760, Price codes: A07 in paper copy, A01 in microfiche. Report to Electric Power Research Institute, Palo Alto, California, April, 1976. 122 p, 2 tab, 10 fig.

Descriptors: *Thermal pollution, *Thermal power, *Thermal power plants, Thermal stress, Thermal water, *Water pollution effects, Ecology, Cooling water, Cooling towers, Water pollution sources, Aquatic environment, Aquatic habitats, *Entrainment, Chemical discharge, *Waste heat management, *Ecosystem characterization.

The Electric Power Research Institute (EPRI) sought to determine the current high-priority research needs which have broad application to defining aquatic power plant impacts. Through an advisory workshop on the Impact of Power Plant Cooling Systems on Aquatic Environments held at Pacific Grove, California, in late September, 1975. This workshop brought together about 30 highly knowledgeable scientists and engineers who were representatives of academia, government, industries, and consulting firms. Projects recommended: and include: (1) population, community, ecosystem effects of reduced survival or changes in distribution; (2) chemical/physical studies; (3) intake effects (near field); (4) ecosystem management; (5) entrainment damage; (6) ecosystem characterization; (7) discharge effects; (8) waste heat management; (9) standardization of methods; (10) information synthesis and evaluation; and (11) information center. Volume I includes the deliberations of the workshop and the research recommendations made. (EIS-Katz)
W79-01755

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON CADMIUM,
National Environmental Research Center, Research Triangle Park, NC.
For primary bibliographic entry see Field 5A.
W79-01756

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
R. B. Juul, and J. V. Shireman.
Water Research, Vol. 12, No. 9, p 691-701, 1978. 6 fig, 2 tab, 19 ref.

Descriptors: *Pulp wastes, *Aquatic life, Fish growth, *Waste water disposal, *Environmental effects, Effluents, Oxidation lagoons, Pulp and paper industry, Diptera, Benthic fauna, Aquatic productivity, Fish diets, Catfishes, Water pollution effects, Industrial wastes.

Studies were performed from June 1974 to September 1975 at the waste water treatment facility of the Hudson full bleach pulp mill near Palatka, Florida, to survey naturally-occurring fish and benthic populations within a kraft pulp mill effluent (channel). After treatment by a primary clarifier and a series of four oxidation ponds, the effluent is discharged through a cement riffleway into an 0.5-0.7 m deep earthen channel. Benthic organisms in the channel were dominated by chironomid larvae whose relative distribution and abundance varied with respect to the channel flow rate and substrate characteristics; concentrations were highest on clay bottom slopes within 1 m of shore. Dissolved oxygen, temperature, pH, flow rate, and BOD were also measured in the channel throughout the study period. A total of 25 species of fish were collected within the channel; some of these fish appeared to be permanent residents and others appeared seasonally, although spawning was never observed. Chironomid larvae were utilized as a food source by both brown bullheads and white catfish. Mosquitofish, the predominant foragers in the channel, were consumed along with coleopterans by larger fish. The growth rates of white catfish and warmouth in the effluent channel were at least comparable to that expected for natural waters. (Schulz-FIRL)
W79-01774

IMPACT OF OFFSHORE OIL AND GAS DEVELOPMENT ON THE COASTAL ZONE: REFORMING THE IMPACT ASSESSMENT PROCESS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Resources.
For primary bibliographic entry see Field 6G.
W79-01783

EFFECTS OF CRUDE OILS ON THE GROWTH OF ARCTIC MARINE PHYTOPLANKTON,
Fisheries and Marine Service, Ste. Anne de Bellevue (Quebec). Artic Biological Station.
S. I. C. Hsiao.
Environmental Pollution, Vol 17, No 2, p 93-107, October 1978. 7 fig, 1 tab, 23 ref.

Descriptors: *Phytoplankton, *Arctic, *Water pollution effects, *Oil pollution, Resources development, Cold regions, Environmental effects, *Oil wastes, *Outer Continental Shelf, *Crude oil, Oil spills, Species sensitivities, Differential growth.

Growth response of arctic marine phytoplankton to crude oils were determined at various temperatures and exposures in a defined medium at constant light energy. The growth of diatoms (Chaetoceros septentrionalis Oestrup, Navicula bahusiensis (Grunow in van Heurck) Grunow and Nitzchia delicatissima Cleve) was inhibited by Atkinson Point, Norman Wells, Pembina and Venezuela crude oils after ten days' exposure at a concentration of 10 ppm at 0C, 5C and 10C. Growth of the green flagellate Chlamydomonas pulsatilla Wohlenweber was stimulated by Norman Wells and Pembina crude oils at 0C. Growth of both diatoms and the green flagellate was markedly inhibited by oil concentrations higher than 100 ppm but diatoms were more severely impaired than the green flagellate. Greater inhibition generally occurred with longer exposure at temperatures between 5C and 10C than at 0C. Chlamydomonas was not killed by any of the crude oils at the concentrations, temperatures and lengths of exposure tested. Lethal effects among diatoms varied with species, types of oil, temperatures and exposure time. Relative species sensitivity of the phytoplankton to the oils was determined based on percentage survival, exponential growth rate and generation time. Chlamydomonas was the most tolerant species and had a greater ability to resume growth, while diatoms were sensitive and had little or no ability to resume growth. Possible ecological consequences of such species sensitivity and differential growth are discussed. (Sinha-OEIS)
W79-01784

TEXAS COASTAL MANAGEMENT PROGRAM ECOLOGICAL SYSTEMS COMPONENT, USER'S MANUAL.
Research and Planning Consultants, Inc., Austin, TX.
Texas General Land Office, (Austin), 15 September 1978. 143 p, 17 fig, 12 tab, 5 append.

Descriptors: *Environmental effects, *Resources development, *Ecology, *Texas, Water pollution effects, Coasts, Data processing, *Outer Continental Shelf, Manuals, Environmental impact.

The Ecological Systems Component (ESC) provides the mechanism for estimating environmental effects of development activities in the Texas Coastal region, though the methodology is not limited to coastal ecosystems. This User's Manual provides a natural scientist with step by step instructions for the documentation of an environmental assessment. It is supplemented by a variety of technical papers. The ESC is, in essence, a simple system of documenting the series of professional judgments which make up all environmental assessments. The length of an assessment using the ESC is determined by the complexity of the activity analyzed and the complexity of the ecosystems where the activity is to occur. The complex issue raised by the ESC is how the 'significance' or 'importance' of an impact on a biological system is to be defined and measured. While this manual makes suggestions on how the magnitude and probability of impacts can be defined, it leaves the definition of these terms to the professional judgment of scientists and policy-makers. (Sinha-OEIS)
W79-01787

MARINE BIOLOGICAL EFFECTS OF OCS PETROLEUM DEVELOPMENT,
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
D. A. Wolfe.
NOAA Technical Memorandum ERL OCSEAP-1, September 1978. 332 p, numerous fig, tab, ref. NOAA-TM-OCSEAP-1.

Descriptors: *Water pollution effects, *Baseline studies, *Oil pollution, *Alaska, Research priorities, Reviews, *Outer Continental Shelf, Petroleum hydrocarbons, Biological effects.

This document contains the proceedings of the first formal scientific review of the Biological Effects Studies managed by NOAA's Outer Continental Shelf Environmental Assessment Program (OCSEAP). The review was conducted November 29-December 1, 1977 at the Northwest and Alaska Fisheries Center in Seattle, Washington. The projects, managed by NOAA/OCSEAP, fall into two categories, based on the sources of financial support: Bureau of Land Management Environmental Studies Program in support of OCS leasing for Alaskan oil and gas development (Part I of Proceedings); NOAA's Energy Resources Project on Fate and Effects of Petroleum Hydrocarbons in Marine Ecosystems and Organisms, which is part of the Federal Interagency Energy/Environment Program, funded through the Environmental Protection Agency (Part II of Proceedings). Part II of the Proceedings contains discussions of selected topics addressed at the Review and a brief synopsis of general comments received from the invited outside reviewers. (Author extracted)
W79-01788

OCSEAP: AN OVERVIEW AND A CONTEXT FOR STUDIES ON BIOLOGICAL EFFECTS,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
D. A. Wolfe.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 1-10, 2 fig, 4 tab, 5 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, Alaksa, *Outer Continental Shelf, Biological effects, Petroleum hydrocarbons.

The Bureau of Land Management (BLM) initiated an extensive marine environmental studies program in response to national needs to assess the potential effects of OCS oil and gas development and to protect the environment. Through the offices of the Outer Continental Shelf Environmental Assessment Program (OCSEAP), the National Oceanic and Atmospheric Administration is planning and conducting for BLM that portion of the environmental studies program applicable to the OCS of Alaska. For each lease area, OCSEAP has implemented a studies program designed to facilitate the assessment of potential OCS-related impacts. The studies program addresses six major tasks or questions, which together will enable BLM to proceed with OCS leasing, while minimizing the environmental risks of subsequent oil and gas development. (See also W79-01788) (Sinha-OEIS)
W79-01789

ACUTE AND CHRONIC TOXICITY, UPTAKE AND DEPURATION, AND SUBLETHAL RESPONSE OF ALASKA MARINE ORGANISMS TO PETROLEUM HYDROCARBONS,
National Marine Fisheries Service, Auke Bay, AK. Auke Bay Lab.
S. D. Rice, J. F. Karinen, and S. Korn.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 11-24, 22 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Toxicity, *Baseline studies, Fish, Shellfish, Alaska, *Outer Continental Shelf, Petroleum hydrocarbons, Crude oil, Fuel oil, Sublethal effects.

Oil effects studies at the Auke Bay Laboratory began in late 1971, however this report describes progress associated with OCSEAP funding which began in the last 2 months of FY 75, and draws primarily from published or drafted manuscripts. The studies can be broken down into two basic themes: (1) Toxicity challenge experiments, where an attempt is made to identify sensitive species, life stages, facotrs that affect toxicity, or components that are most responsible for toxicity; and (2) sublethal physiological response, where an attempt is made to identify, measure, and characterize physiological responses that are indicative of oil stress. Results from the series of sublethal effects studies may have application to monitoring effects of oil and defining the mode of action of toxicants. (See also W79-01788) (Sinha-OEIS)
W79-01790

SUBLETHAL EFFECTS OF PETROLEUM HYDROCARBONS AND TRACE METALS INCLUDING BIOTRANSFORMATIONS, AS REFLECTED BY MORPHOLOGICAL, PHYSIOLOGICAL, PATHOLOGICAL, AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
D. C. Malins, E. H. Gruger, H. O. Hodgins, N. L. Karrick, and D. D. Weber.
In: NOAA Techn Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' Sept 1978. p 25-40, 2 fig, 1 tab.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Toxicity, Alaska, Metals, Biochemistry, *Heavy metals, *Oute Continental Shelf, Petroleum hydrocarbons, Trace metals, Sublethal effects.

A significant body of evidence has been accumulated to indicate that aromatic hydrocarbons are rapidly and progressively converted to metabolites in the pelagic and demersal fish and in invertebrate larval forms. The literature on animal systems in general affirms the concept that extremely low levels of arene oxides are damaging to biological systems in many ways, which includes their strong mutagenic and carcinogenic potential. The tendency of starry flunder to accumulate high proportions of metabolites in skin is of interest with respect to their known susceptibility to lesion formation in this tissue. Evidence presented for the role of mucus in the excretion of naphtahlene and metabolites in fish suggests that such exudates must be considered along with other routes of elimination which lead to the recycling of petroleum and metabolic products in the marine environment. The findings to day imply that the pelagic species may be less susceptible to accumulating aromatic hydrocarbons from the environment than the demersal species, although a wider variety of different organisms must be studied in each class to verify this hypothesis. (See also W79-01788)(Sinha-OEIS)
W79-01791

BIOLOGICAL FATE OF METALS IN FISH,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
U. Varanasi.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 41-53, 1 fig, 4 tab.

Descriptors: *Oil pollution, *Water pollution effects, *Toxicity, *Baseline studies, *Arctic, Alaska, Fish, Lead, Cadmium, Metals, Salmon, Flounder, *Outer Continental Shelf, Trace metals, Oncorhynchus kisutch, Platichthys stellatus.

To obtain the most comprehensive and in-depth evaluation of the impact of trace metals on arctic and subarctic organisms, the investigation was carried out in three separate phases: (1) Biochemical interactions of trace metals in fish which dealt with patterns of uptake, accumulation, and retention of lead and cadmium in key tissues of fish exposed to low levels of water-borne metals at 4 degree and 10 degrees C (Subcellular distribution of metals as well as mechanisms of excretion were also studied); (2) evaluation of importance of skin and epidermal mucus in metabolism and excretion of metals which defines uptake, accumulation and discharge of trace metals from epidermal mucus, skin, and scales of fish; and (3) influence of metal exposure on hydrocarbon metabolism in fish. This study was initiated to assess alterations in the profiles of metabolites of hydrocarbons (e.g., naphthalene) in tissues of fish exposed to lead and cadmium. (See also W79-01788) (Sinha-OEIS)
W79-01792

THE EFFECTS OF ALASKAN CRUDE OIL ON FLATFISH, AND THE PREVALENCE OF FISH PATHOLOGY IN ALASKAN MARINE WATERS.
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
B. B. McCain.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 54-71, 12 fig.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Fish diseases, Alaska, Pathology, *Outer Continental Shelf, Flatfish, Crude oil.

Data from two separate studies are presented. One study concerns the long-term pathological effects of exposing flatfish to sediments contaminated with Alaskan crude oil, and the other deals with the prevalence, distribution, and pathology of disease of demersal fishes in the Bering Sea, Gulf of Alaska, Norton Sound, and Chukchi Sea. The pathological effects of crude oil-contaminated sediments on flatfish were investigated by a multidisciplinary effort involving the fields of pathology, analytical chemistry, fishery biology, and electron microscopy. In addition to identifying the types of pathological conditions in Alaskan marine fish and their prevalence and geographical distribution, the baseline study included efforts to determine the cause(s) of these conditions. The principal contribution of these baseline studies has been the demonstration that significant frequencies of disease are presently in the demersal fish populations associated with Alaska's Outer Continental Shelf. The studies have also provided information concerning the species free of detectable disease and those species affected by specific diseases, the geographic distribution of affected fish, and the possible causes of some of the diseases. (See also W79-01788) (Sinha-OEIS)
W79-01793

PHYSIOLOGICAL AND BEHAVIORAL EFFECTS,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
H. O. Hodgins.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 72-86, 4 fig, 5 tab.

Descriptors: *Water pollution effects, *Oil pollution, *Baseline studies, *Physiology, Animal behavior, Salmonids, Alaska, Arctic, *Outer Continental Shelf, Petroleum hydrocarbons, Disease resistance, Oncorhynchus, Pandalus platyceros, Onchidoris, Salmo, North Pacific Ocean.

Physiological and behavioral studies were designed as laboratory experiments--with the notable exception of field studies of salmon homing--to evaluate effects of sublethal petroleum exposure on species indigenous to the North Pacific Ocean tested under natural water quality and temperature conditions. The studies have provided clear implications that in certain instances heavy exposures of fish to the petroleum have little effect on physiology; whereas, in other instances, severe effects may result from light to moderate exposures to petroleum. In the category of 'severe exposure--little effect' are the studies of oil in the diet on trout reproduction, and the disease resistance research with salmon and trout. In both of these studies high doses of crude oil in diets induced little or no detectable physiological impairment. Conversely, exposure of spot shrimp and dorid nudibranchs to ppb levels of petroleum in seawater resulted in potentially disastrous effects on feeding behavior, reproductive behavior, or embryogenesis. Other studies, such as effects of petroleum on salmon migration, may fall somewhere between the above two extremes. (See also W79-01788) (Sinha-OEIS)
W79-01794

MORPHOLOGY,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
J. W. Hawkes.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 87-92, 1 tab.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Morphology, *Toxicity, Salmonids, Fish, Alaska, Arctic, *Outer Continental Shelf, Petroleum hydrocarbons, Environmental stress, Flatfish, Prudhoe Bay, Crude oil.

The two major objectives are to identify the effects of petroleum on fish at the cellular level and to establish which tissues show that most obvious and repeatable structural alterations. A series of experimental designs have been followed to assess the effects of Prudhoe Bay crude oil or its water-soluble fraction on both pelagic and demersal species and on adult and young. The findings are reported by considering each major target organ and describing the alterations observed for each type of experiment and variation. The common theme is the type of cellular response of selected organs or tissues to toxic substances; namely, petroleum hydrocarbons. The observed liver changes parallel hepatic alterations known for other animals to be pre-neoplastic. These changes indicate that the ability of fish to survive additional routine environmental stress may be reduced because of depletion of energy reserves or reduced liver functions. (See also W79-01788)(Sinha-OEIS)
W79-01795

OVERVIEW,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
D. C. Malins.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development' September 1978. p 92-105.

Descriptors: *Water pollution effects, *Oil pollution, *Baseline studies, *Heavy metals, Alaska, Arctic, Invertebrates, Bibliographies, *Outer Continental Shelf, Petroleum hydrocarbons.

Results of a number of studies indicate that many marine invertebrates, particularly larval forms, are highly susceptible to petroleum pollution. Research on the biological fate of aromatic hydrocarbons in larval invertebrates has shown that these developmental stages can substantially bioconcentrate aromatic hydrocarbons from the water column. The feeding and reproductive behavior of two marine invertebrates, shrimp and nudibranchs, and the embryonic development of nudibranchs, also appear to be particularly sensitive to low levels of petroleum hydrocarbons in seawater. Studies on the biologica fate of heavy metals in arctic and subarctic marine organisms reveal that metals are bioconcentrated, and accumalate in certain organs. Slight elevations in concentrations to toxic metals above levels found in seawater can alter the metabolism of aromatic hydrocarbons. This finding support the hypothesis that increases in metal present in polluted environments, possibly arising from petroleum operations, may significantly alter the biological fate of aromatic hydrocarbons in marine organisms. (See also W79-01788) (Sinha - OEIS)
W79-01796

TRANSPORT, RETENTION, AND EFFECTS OF THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL IN EXPERIMENTAL FOOD CHAINS,
National Marine Fisheries Service, Tiburon, CA. Southwest Fisheries Center.
J. A. Whipple, T. G. Yocom, P. E. Benville, D. R. Smart, and M. H. Cohen.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 106-129, 6 fig, 6 tab, 8 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Food chains, Baseline studies, Alaska, *Outer Continental Shelf, Petroleum hydrocarbons, Crude oil, Cook Inlet.

The objectives of this study are to determine the accumulation and passage of petroleum constituents in experimental marine food chains and the effects of petroleum exposure on the test organisms. The methods and apparatus of the experiments are described and the results of the three experiments are given. (See also W-79-01788) (Sinha - OEIS)
W79-01797

BIOAVAILABILITY OF HYDROCARBONS AND HEAVY METALS TO MARINE DETRITIVORES FROM OIL-IMPACTED SEDIMENTS,
Battelle Pacific Northwest Lab., Sequim, WA. Marine Research Lab.
J. W. Anderson, G. Roesijadi, and E. A. Crecelius.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 130-148, 1 fig, 8 tab, 30 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Sediments, Baseline studies, Heavy metals, Benthos, Alaska, *Outer Continental Shelf, Hydrocarbons, Petroleum hydrocarbons, Detritivores, Protothaca staminea, Macoma inquinata, Phascolosoma agassizii.

Studies were conducted to assess the potential damage of oil-contaminated marine sediments on benthic organisms and the availability of this material to marine food-webs and eventually man. There appears to be a tissue accumulation pattern associated with the molecular weight of the petroleum hydrocarbon, which is probably dependent on relative partitioning coefficients. From other studies it seems that tissue retention times, while animals are in clean water, increases with the size of the hydrocarbon, and the number of side chains (alkylation). No single study with one organism and one type of system has been conducted to produce these data, but the basic pattern appears to exist. Present evidence indicates that hydrocarbons bound to sediment particles are not directly available to deposit/detritus-feeding organisms. (See also W79-01788)
W79-01798

ACTIVITY-DIRECTED FRACTIONATION OF PETROLEUM,
Battelle Memorial Inst. Columbus, OH.
J. S. Warner.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 149-155, 2 fig, 1 tab, 7 ref.

Descriptors: *Oil pollution, *Water pollution effects, Baseline studies, Alaska, *Outer Continental Shelf, Petroleum, Petroleum hydrocarbons, Crude oil, Fractionation.

The program on activity-directed fractionation of petroleum is in its formative stage so there are no results yet to present and discuss. This presentation describes the basis for the program, its objectives, and the research plan. Generally the chemical analyses are limited to the determination of components that can be detected most easily, the volatile and semivolatile hydrocarbons that can be detected by gas chromatography. Unfortunately petroleum is also comprised of many other components including nonvolatile and polar components. The research program is designed to assess the potential biological activity of these generally ignored petroleum components. Since normal paraffins are degraded relatively rapidly by microorganisms and the toxic light aromatic hydrocarbons are rapidly lost from an oil slick by dissolution and evaporation, any program concerning the potential long-term biological effects of an oil spill needs to consider the other components remaining in weathered petroleum. (See also W79-01788) (Sinha - OEIS)
W79-01799

POTENTIAL INTERACTION OF MICROORGANISMS AND POLLUTANTS FROM PETROLEUM DEVELOPMENT,
Louisville Univ., KY. Dept. of Biology.
R. M. Atlas.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 156-166, 2 fig, 1 tab, 8 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Microorganisms, *Alaska, Baseline studies, Weathering, Ice, *Outer Continental Shelf, Petroleum hydrocarbons, Light hydrocarbons.

As a result of data gathered ancillary to reconnaissance and fate of oil studies, some limited results have been found on the effects of oil on microorganisms. It was found that hydrocarbons are degraded very slowly. Persistence from a moderate oil spill must be thought of in terms of years instead of days, or months. Under certain conditions, such as under ice the physical evaporative losses of light hydrocarbons, many of which are highly toxic, are greatly restricted. Similarly, losses of light hydrocarbons in sediment appear to be restricted due to adsorption. Components, such as naphthalene, are found still present weeks after spillage under ice. The implication of this finding is that low molecular weight oil components will reside for prolonged periods under certain conditions in Alaska ecosystems. In contrast to sediment and under ice, volatile components are lost within days from open water spillages. The residual oil recovered from these studies had the same composition of the oil in terms of component classes as the freshly spilled oil. (See also W79-01788) (Sinha - OEIS)
W79-01800

MICROBIAL ACTIVITY AND CRUDE OIL-MICROBIAL INTERACTIONS IN WATER AND SEDIMENTS,
Oregon State Univ., Corvallis. Dept. of Microbiology; and Oregon State Univ., Corvallis. School of Oceanography.
R. Y. Morita, R. P. Griffiths, T. M. McNamara, and S. E. Steven.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development, 'September 1978. P 167-187, 11 fig, 3 tab, 3 ref.

Descriptors: *Water pollution effects, *Oil pollution, Microorganisms, *Biodegradation, Baseline studies, *Alaska, Sediments, Food webs, Bacteria, Nitrogen fixation, *Outer Continental Shelf, Crude oil, Cook Inlet.

Research efforts deal mainly with direct counts of the microbial population (epifluorescent counts), heterotrophic activity at in situ temperature, and laboratory studies dealing with microbial functions at low temperature in relation to petroleum degradation (crude oil used froml the specific locality), nitrogen fixation, chitinase activity, etc. in the presence and absence of crude oil. The relative microbial activity as determined by the heterotrophic potential method for the Lower Cook Inlet during April and October cruises are presented. The highest level of activities were seen in the northern-most stations using either glucose or glutamic acid as substrates. Lower values offshore were observed to the southwest of Kamishak Bay, in the center of the inlet. Values found in Kachemak Bay were still lower, and those values seen in the south and southeastern sections were the lowest. This is very similar to the pattern of relative microbial uptake that was seen in water samples analyzed during the fall 1976 cruise in the same area. (See also W79-01788) (Sinha-OEIS)
W79-01801

INFLUENCE OF PETROLEUM ON EGG FORMATION AND EMBRYONIC DEVELOPMENT IN SEABIRDS,
California Univ. at Davis, Stinson Beach. Point Reyes Bird Observatory.
D. G. Ainley, and C. R. Grau.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. P 188-198, 4 tab, 8 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Birds, *Reproduction, Baseline studies, California, Alaska, *Outer Continental Shelf, Seabirds, Crude oil, Bunker C oil, Prudhoe Bay, Ptychoramphus aleutica, Larus occidentalis.

This study appraises the effects that a brief exposure to an oil spill would have on the reproduction of Cassin's Auklets (Ptychoramphus aleutica) and on Western Gulls (Larus occidentalis) nesting on the Farallon Islands of California. These species are representative of many birds breeding along the Pacific Coast that are at risk from oil pollution during the reproductive period. Females of breeding pairs of auklets were dosed with bunker C oil or empty capsules as controls, and egg production, hatching success, and fledging success were determined. Samples of eggs were compared in regard to yolk structure, presence of oil components, and embryonic development. Attempts to dose gulls were unsuccessful. (See also W79-01788) (Sinha-OEIS)
W79-01802

EFFECTS OF PETROLEUM EXPOSURE ON THE BREEDING ECOLOGY OF THE GULF OF ALASKA HERRING GULL GROUP (LARUS ARGENTATUS X LARUS GLAUCESCENS)M,
Johns Hopkins Univ., Baltimore, MD. Dept. of Pathobiology.
S. M. Patten, Jr., and L. R. Patten.
In: NOAA Technical Memorandum ERL OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. P 199-215, 10 fig, 5 tab, 13 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Birds, *Breeding, Ecology, Alaska, Baseline studies, *Outer Continental Shelf, Petroleum hydrocarbons, Crude oil, North Slope, Gulf of Alaska, Herring gulls, Larus argentatus, Larus glaucescens.

An analysis is given of the effects of petroleum exposure on the breeding ecology, including incubation behavior and hatching success, of the Gulf of Alaska Herring Gull group (Larus argentatus x Larus glaucescens). Conclusions from the experiments are: very small amounts of North Slope Crude Oil exposure to gull eggs in the field, at early stages of incubation, lead to high embryonic mortality. Embryonic resistance to petroleum exposure increases with the duration of incubation. Mineral oil in equivalent microliter doses causes no significant mortality. (See also W79-01788) (Sinha-OEIS)
W79-01803

EFFECTS OF OILING ON TEMPERATURE REGULATION IN SEA OTTERS,
Scripps Institution of Oceanography, La Jolla, CA. Physiological Research Lab.
G. Kooyman, and D. Costa.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. P 216-221, 2 fig, 3 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Water temperature, Animal metabolism, Mammals, Otters, Baseline studies, Respiration, *Outer Continental Shelf, Crude oil, Enhydra lubris.

Two otters are presently being studied at the Physiological Research Laboratory, Scripps Institution of Oceanography. After conditioning the otters accepted confinement in the metabolic test chamber, and their normal metabolic rates were measured at a variety of water temperatures. To date 38 six hour metabolic runs at six different water temperatures between 5 and 30C have been made. The thermal neutral zone for otters has been preliminarily established and appears to have a lower critical temperature between 5 and 10C. Prudhoe crude oil has been applied to one otter on two different occasions and changes in metabolic rate after oiling and washing have been made. The application of 38 mls and 60 mls of crude oil upon the dorsal surface of the sea otter increased the otter's average metabolic rate 24% and 60% respectively. However, two weeks after the oiling experiment, routine blood samples were taken from both otters for routine examination and the otter which had been oiled exhibited an unusually high white blood cell count. The otter was then transferred to Sea World for veterinary care and is currently still at Sea World suffering from what is believed to be a deep seated pneumonia. The pneumonia is probably a result of the stress encountered by the otter during the post-washing period. (See also W79-01788) (Sinha-OEIS)
W79-01804

AN OVERVIEW OF NOAA'S ENERGY RESOURCES PROJECT ON FATE AND EFFECTS OF CONTAMINANTS IN MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanic and Atmospheric Administra-

tion, Boulder, CO. Environmental Research Lab.
D. A. Wolfe.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. P 223-225, 5 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Environmental effects, Marine biology, Ecosystems, Baseline studies, *Outer Continental Shelf, Petroleum development.

The general objectives of the National Oceanic and Atmospheric Administration's (NOAA) energy resources project on fate and effects are to identify and conduct laboratory and field research studies that will facilitate the assessment of potential environmental impacts from petroleum releases in coastal marine ecosystems. This effort does not have a site-specific orientation; instead, it is focused on the fundamental processes that control the distribution, transport, and effects (including physiological and ecological aspects) of petroleum components, toxic metals, and other contaminants in coastal ecosystems. It is expected that the results of the process-oriented studies conducted under this project will have broad applicability to environmental problems in widely separated geographic areas. (See also W79-01788) (Sinha-OEIS)
W79-01805

THE NOAA NATIONAL ANALYTICAL FACILITY -- A STATUS REPORT,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Conservation Div.
W. D. MacLeod, Jr., D. W. Brown, and L. C. Thomas.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 226-237, 3 fig, 2 tab, 6 ref.

Descriptors: *Water pollution, *Environmental effects, *Facilities, *Research facilities, Baseline studies, Resources development, *Outer Continental Shelf, Research priorities.

The NOAA National Analytical Facility was established at the Northwest and Alaska Fisheries Center to provide NOAA's environmental programs with detailed information on the types and amounts of trace chemical contaminants in the marine environment. The Facility is associated with an experienced multidisciplinary team of chemists, biochemists, biophysicists, and physiologists engaged in studies on contaminant-induced changes in marine biota. Interaction with this team of scientists is important in relating the analytical work of the Facility to environmental issues and placing interpretations of the data in an environmental perspective. As part of its on-going research, the Facility is investigating applications of high pressure liquid chromatography and ultraviolet fluorescence spectrometry for the analysis of oil and its toxic constituents. These techniques should be developed into new standard methods which should then be compared with the existing ones. This applies especially to the analysis of the aromatic constituents of petroleum and their transformation products. (See also W79-01788) (Sinha-OEIS)
W79-01806

POSSIBLE TRACE METAL MOBILIZATION OF SELECTED TRACE ELEMENTS FROM OIL-IMPACTED SEDIMENTS,
Colorado Univ., Boulder. Dept. of Chemistry.
J. S. Miller, R. E. Sievers, G. Lange, J. Stanley, and R. R. Meglen.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 238-243, 1 fig, 4 tab.

Descriptors: *Oil pollution, *Water pollution effects, *Sediments, *Trace elements, *Heavy metals, Testing procedures, Baseline studies, Mercury, Arsenic, Chromium, Nickel, *Outer Continental Shelf, Petroleum hydrocarbons, Crude oil.

Research efforts at the University of Colorado were undertaken to experimentally test whether selected trace metals can be mobilized or released from oil-impacted sediments in natural seawater. Release of trace elements from either the bottom or, less importantly, from the crude oil (the potential for trace element release from oil itself is somewhat less than the potential release from the bottom sink due to interaction with constituents of petroleum) could alter the trace element concentrations potentially available to the ocean flora and fauna. Four target elements--mercury, arsenic, chromium, nickel--were studied. Under the experimental conditions used, results do not indicate any mobilization for three of the selected target metals occurring as the result of the interaction of oil upon sediments. Work is currently in progress for the remaining target element. (See also W79-01788) (Sinha-OEIS)
W79-01807

THE EFFECTS OF PETROLEUM HYDROCARBONS ON CHEMORECEPTION IN DUNGENESS CRAB CANCER MAGISTER.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
B. L. Olla.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 244-249, 12 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Animal behavior, Baseline studies, Crabs, *Outer Continental Shelf, *Petroleum hydrocarbons, Chemoreception, Cancer magister, Feeding behavior.

Food detection and gathering, predator recognition and escape, establishment and maintenance of commensal, symbiotic and parasitic relationships, and courtship and mating are all behaviors heavily relying upon chemoreception. The effect of petroleum upon those behaviors was investigated mediated by chemoreception in the Dungeness crab, Cancer magister. It was found that antennular flicking rate changes indicate that blue crabs can detect the hydrocarbons, naphthalene and methylnaphthalene, in seawater solution. The detection threshold for naphthalene is higher than for the DECE, and the threshold for methylnaphthalene is considered higher than that for naphthalene. Such results indicate tha antennular behavior in the blue crab may be a general response to any chemical change of the crab's environment. The usefulness of behavioral assays based upon antennular motion for other crabs and a variety of chemicals, natural and artificial, seems quite promising. (See also W79-01788) (Sinha-OEIS)
W79-01808

INTERACTIVE EFFECTS OF RESIDUES OF HYDROCARBONS, CHLORINATED HYDROCARBONS, AND HEAVY METALS ON THE METABOLISM AND BIOACCUMULATION OF PETROLEUM HYDROCARBONS IN MARINE FISH,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
E. H. Gruger, Jr., J. W. Hawkes, and D. C. Malins.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 250-269, 2 fig, 37 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Chlorinated hydrocarbon pesticides, *Metabolism, Heavy metals, Fish, Salmonids, Baseline studies, *Outer Continental Shelf, *Hydrocarbons, Petroleum hydrocarbons, Chlorobiphenyls, Bioaccumulation, Oncorhyncus, Salmo.

Research has uncovered some important factors that deal with interactive biochemical and morphological effects of contaminants in organisms in the marine environment. Species difference, wide variations among individual fish to respond biochemically to contaminants, and the potential for simultaneous interactions of chemicals from more than one class are factors which must be seriously considered in attempting to resolve environmental problems. The research specifically leads to the conclusion that chlorobiphenyls may either enhance or retard the normal biotransformations of petroleum aromatic hydrocarbons in exposed fish, in terms of responses of the hepatic microsomal AHH systems in chinook and coho salmon. Moreover, morphological changes occur in salmon as a result of food-path exposures of chlorobiphenyls and hydrocarbons; the changes appear less severe when the chemical classes are administered separately to the fish. Importantly, synergistic action by the two types of chemicals were apparent in morphological changes and increases in liver AHH activities for exposed salmon. The finding varied AHH activities relative to different substrates has important implications about the metabolism of petroleum hydrocarbons. (See also W79-01788) (Sinha-OEIS)
W79-01809

DESIGN OF FIELD EXPERIMENTS TO DETERMINE THE ECOLOGICAL EFFECTS OF PETROLEUM IN INTERTIDAL ECOSYSTEMS,
Resource Management Associates, Lafayette, CA.
S. F. Moore, and D. B. McLaughlin.
In: NOAA Technical Memorandum ERL-OCSEAP-1, 'Marine Biological Effects of OCS Petroleum Development,' September 1978. p 270-290, 5 fig, 2 tab, 6 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Intertidal areas, *Ecosystems, *Baseline studies, Environmental effects, Resources development, Testing procedures, Ecology, *Outer Continental Shelf, Petroleum hydrocarbons, Field experiments.

A primary goal of field experiments is to learn more about causal relationships between controlled perturbations (treatments) and field observations. Specifically the goal is to design experiments which address the following objective: To study in the upper rocky intertidal community the effects on species abundance and distribution of various amounts and compositions of petroleum substances which may disturb the natural system in the following ways: physical/chemical disturbance, direct competition for space, disruption of competition and predation, and interaction with natural physical disturbances such as wave exposure and dessication. This paper highlights and summarizes the results of the study which resulted in a set of ecological and statistical design criteria to guide the translation of this overall objective into specific experimental designs. (See also W79-01788) (Sinha-OEIS)
W79-01810

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 1, BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Programs.
Final Reports of Principal Investigators, Vol 1, June 1978. 490 p.

Descriptors: *Oil pollution, *Water pollution effects, *Baseline studies, *Resources development, Alaska, Plankton, Fishes, Biota, Invertebrates, Birds, Bibliographies, *Outer Continental Shelf, *Petroleum hydrocarbons, Lethal effects, Sublethal effects.

Seven final reports on baseline studies of the aquatic fauna and ecology of the Alaskan Continental Shelf which assess the environmental effects of petroleum developments in that area are compiled in this volume. Titles are: Lethal and Sublethal Effects on Selected Alaskan Marine Species after Acute and Long-term Exposure to Oil and Oil Components; Food and Feeding Relationships in the Benthic and Demersal Fishes of the Gulf of Alaska and Bering Sea; A Review of the Leterature and a Selected Bibliography of Published and Unpublished Literature on Marine Birds of Alaska; Determination and Description of Kknowledge of the Distribution, Abundance, and Timing of Sal-

monids in the Gulf of Alaska and Bering Sea; Ichtyoplankton of the Eastern Bering Sea; Environmental Assessment of the Southeastern Bering Sea: Zooplankton and Micronektona; and Trawl Survey of the Epifaunal Invertebrates of Norton Sound, Southeastern Chuckchi Sea, and Kotzebue Sound. (See W79-01812 thru W79-01817) (NOAA)
W79-01811

LETHAL AND SUBLETHAL EFFECTS ON SELECTED ALASKAN MARINE SPECIES AFTER ACUTE AND LONG-TERM EXPOSURE TO OIL AND OIL COMPONENTS,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
S. D. Rice, S. Korn, and J. F. Karinen.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol. 1, Biological Studies, June 1978. P 1-32, 2 tab, 25 ref. R7120822.

Descriptors: *Oil pollution, *Water pollution effects, *Toxicity, Alaska, Biota, Environmental effects, Baseline studies, *Outer Continental Shelf, Bering Sea, Beaufort Sea, Sublethal effects.

The research involves physiological and bioassay testss of applied research on species indigenous to the Gulf of Alaska, Bering Sea, and Beaufort Sea. The major emphasis has shifted from strictly descriptive acute toxicity determinations to mechanistic studies and sublethal tests that will eventually allow prediction of oil impacts on the biota. The studies have two basic themes. Toxicity challenge experiments, where sensitive species, live stages, factors that affect toxicity, or components that are most responsible for toxicity are identified; and sublethal physiological response, where physiological responses that are indicative of oil stress are identified, measured, and characterized. (See also W79-01811) (Sinha - OEIS)
W79-01812

FOOD AND FEEDING RELATIONSHIPS IN THE BENTHIC AND DEMERSAL FISHES OF THE GULF OF ALASKA AND BERING SEA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, A. C. Paulson, and J. R. Rose.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 1, Biological Studies, June 1978. P 33-107, 2 fig, 28 tab, 48 ref.

Descriptors: *Water pollution effects, *Baseline studies, *Food habits, Marine fish, Oil pollution, Resources development, Benthos, *Outer Continental Shelf, Gulf of Alaska, Bering Sea, Demersal fish.

The rationale behind this study was to develop an ability to predict the impact of oil developmet activities on the fishes in these two areas. The study, coupled with others designed to study acute and chronic toxic effects on the fish populations, will help establish the predictive base necessary to make management decisions. The research findings on polock, rex sole, rock sole, dover sole, flathead sole, arrowthooth flounder, Greenland halibut, capelin and shortfin eelpout are discussed. Existing information on Pacific cod, yellowfin sole and Pacific halibut is summarized. (See also W79-01811) (Sinha - OEIS)
W79-01813

A REVIEW OF THE LITERATURE AND A SELECTED BIBLIOGRAPHY OF PUBLISHED AND UNPUBLISHED LITERATURE ON MARINE BIRDS OF ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
J. C. Bartonek, and C. J. Lensink.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program Final Reports of Principal Investigators Vol 1 Biological Studies, June 1978. P 108-204, 1 fig, 1 tab. o1-06-022-11437.

Descriptors: *Birds, *Bibliographies, *Water pollution effects, Environmental effects, Baseline studies, Alaska, Oil pollution, *Outer Continental Shelf, *Petroleum development, Literature reviews, Bering Sea, Gulf of Alaska.

A bibliography of more than 900 references published before and during 1976 on birds of the coastal and marine environment with emphasis being on those birds from Alaska and adjacent areas is contained in this report. A cursory review of some of that information was made. The purpose of this report is to facilitate the identification of literature that is of regional ana topical importance in describing coastal and marine avifaunas and in assessing impacts upon those avifaunas from whatever causes. (See also W79-01811) (Sinha - OEIS)
W79-01814

DETERMINATION AND DESCRIPTION OF KNOWLEDGE OF THE DISTRIBUTION, ABUNDANCE, AND TIMING OF SALMONIDS IN THE GULF OF ALASKA AND BERING SEA. A SUPPLEMENT,
Washington Univ., Seattle. Fisheries Research Inst.
D. E. Rogers.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 1, Biological Studies, June 1978. P 205-235, 9 fig, 11 tab, 3 ref.

Descriptors: *Salmon, *Water pollution effects, Baseline studies, Environmental effects, Alaska, Oil pollution, Outer Continental Shelf, Petroleum development, Gulf of Alaska, Bering Sea, Bristol Bay.

The annual variation in abundance and seasonal timing of the migrations of adult and juvenile (smolt) salmon since 1951 in the nearshore waters of Bristol Bay is described. The number of juvenile or adult salmon that migrate through Bristol Bay in an average year is best measured by the median number because the annual numbers are not normally distributed. The medians and ranges in the annual numbers of salmon are given in tabular form. In most years there is either a large abundance of smolts or a large abundance of adults. Years in which there are very large numbers of sockeye salmon occur at 4- or 5-year intervals. Juvenile pink salmon are usually present only in odd-numbered years and adult pink salmon are usually present only in even-numbered years. The Naknek-Kvichak District produced 36% of the smolts and 54% of the adult salmon in Bristol Bay in an average year; whereas, the Nushagak District produced 50% of the smolts but only 25% of the adults in Bristol Bay in an average year. Salmon are present in Bristol Bay from May through September; however, they are most abundant in June and July when there are usually millions of adults and hundreds of millions of smolts that are passing each other in their migrations to and from Bristol Bay. (See also W79-01811) (Sinha - OEIS)
W79-01815

ENVIRONMENTAL ASSESSMENT OF THE SOUTHEASTERN BERING SEA: ZOOPLANKTON AND MICRONEKTON,
Alaska Univ., College. Inst. of Marine Science.
R. T. Cooney.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Report of Principal Investigators, Vol 1, Biological Studies, June 1978. p 238-337, 33 fig, 6 tab, 12 ref, 3 append. 03-5-022-56.

Descriptors: *Plankton, *Zooplankton, *Environmental effects, *Oil pollution, *Biota, *Water pollution effects, Baseline studies, Alaska, Resources development, Sea ice, *Outer Continental Shelf, *Micronekton, Ice pack, Petroleum development, Bering Sea, Environmental impact, Calamus plumchrus.

Outer Bristol Bay and the St. George Basin area were both considered potential sites for offshore petroleum development and as such warrented careful examinations of community composition and descriptions of seasonality. Since most species found in these waters (excluding sea birds and marine mammals) pass through and early planktonic life history stage, an understanding of the ecology of this complex assemblage was thought to be of great importance in assessing the possible effect of offshore industrial development. This study reveals that there is nothing particularly unusual about the animal plankton and micronekton communities in the southeastern Bering Sea. What is not clearly known, is how these populations exploit their environment in this region and are in turn utilized by other members of the community. Although nearly 200 species can be found, only 20 or 30 are trophically important at the lowest consumer levels in maintaining the large populations which feed upon them. From an ecological vantage point, this result indicates that most of the organic carbon utilized by pelagic grazers passess through relatively few but abundant subpopulations which sustain the rest of the system. While this may be biologically efficient, it could become critical if these sustaining populations were adversely affected in any long term way. However, since the coastal shelf areas tend to be influenced by relatively steady current flow, any localized effects would soon be absorbed by mixing and advection. (See also W79-01811) (Sinha - OEIS)
W79-01816

TRAWL SURVEY OF THE EPIFAUNAL INVERTEBRATES OF NORTON SOUND, SOUTHEASTERN CHUKCHI SEA, AND KOTZEBUE SOUND,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder, and S. C. Jewett.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol. 1, Biological Studies, June 1978. p 338-486, 26 fig, 16 tab, 12 append. 03-5-022-56.

Descriptors: *Ecosystems, *Water pollution effects, *Invertebrates, Baseline studies, Alaska, Oil and gas, Oil pollution, Resources development, *Outer Continental Shelf, Petroleum development, Environmental impact, Norton Sound, Chukchi Sea, Kotzebue Sound, Epifauna.

It was the primary intent of this investigation to collect information on the composition, distribution, and biology of the epifaunal invertebrate components of Norton Sound, southeastern Chukchi Sea, and Kotzebue Sound. The trawl survey for the investigation of epifaunal invertebrates was effective, and excellent spatial coverage of the shelf of the northeastern Bering Sea and southeastern Chukchi Sea was obtained. Taxonomic analysis of the invertebrates collected in the Norton Sound area delineated 13 phyla and 187 species; Chukchi Sea - Kotzebue Sound invertebrates consisted of 11 phyla and 171 species. Echinoderms made up the bulk of the invertebrate biomass with 80.3% in the Norton Sound region and 59.9% in the Chukchi Sea - Kotzebue Sound region. Other important phyla were Arthropoda and Mollusca. The importance of deposit-feeding clams in the diet of starry flounders and sea stars is demonstrated. A high probability exists that oil hydrocarbons will enter starry flounders, sea stars and other bivalve predators via deposit-feeding molluscs, suggesting that studies interrelating sediment, oil, deposit-feeding clams, and appropriate predator species should be initiated soon. (See also W79-01811) (Sinha - OEIS)
W79-01817

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 2. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continenta Shelf Environmental Assessment Program.
Final Reports of Principal Investigators, Vol 2, June 1978. 959 p.

Descriptors: *Baseline studies, *Resources development, *Oil pollution, *Water pollution effects, *Alaska, Environmental effects, Shellfish, Fish, *Outer Continental Shelf, *Gulf of Alaska, Demersal fish, Petroleum development.

A final report in three parts on baseline studies of the aquatic fauna and ecology of the Alaskan Continental Shelf which assesses the environmental effects of the petroleum developments in that area is included in this volume. Title of the report is: Demersal Fish and Shellfish Resources of the Gulf of Alaska from Cape Spencer to Unimak Pass, 1948 - 1976: A Historical Review. (See W79-01819 thru W79-01821) (NOAA)
W79-01818

DEMERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM CAPE SPENCER TO UNIMAK PASS 1948 - 1976. A HISTORICAL REVIEW. VOLUME 1,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
L. L. Ronholt, H. H. Shippen, and E. S. Brown.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol. 2, Biological Studies, June 1978. p 1-304.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, Fish, Shellfish, Fisheries, Water quality, Alaska, *Outer Continental Shelf, *Gulf of Alaska, *Resource availability, Environmental assessment, Demersal fisheries, Petroleum development.

The study area includes the continental shelf and upper slope in the northern Gulf of Alaska from Cape Spencer to Unimak Pass. The first volume of their report contains: (1) a description of the study area including its physical features and fauna; (2) a listing of the data sources utilized; (3) a general review of the history of exploitation of demersal finishes and shellfishes by domestic and foreign producers; (4) a review by regions within the study area of fish catches by the Unites States and Japan from 1969 through 1974/1975, and a review of the joint United States-Canada halibut catch from 1960-1968 and from 1969-1975; (5) a listing and plotting of specific locations of high productivity for U.S. Fisheries from 1960-1975, and for Japanese bottomfish catches from 1964-1974; and (6) a description of and results obtained from exploratory fishing cruises for demersal fishes and shellfishes within the study area from 1948 through 1970. (See also W79-01818) (Sinha - OEIS)
W79-01819

DEMERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM CAPE SPENCER TO UNIMAK PASS 1948 - 1976. A HISTORICAL REVIEW. VOLUME 2,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
L. L. Ronholt, H. H. Shippen, and E. S. Brown.
In: NOAA/ERL Outer Continenta Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 2, Biological Studies, June 1978. p 305-623.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, Fish, Shellfish, Fisheries, Water quality, Alaska, *Outer Continental Shelf, *Gulf of Alaska, *Resource availability, Environmental assessment, Demersal fisheries, Petroleum development.

Volume 2 of the report on the area which includes the continental shelf and upper slope in the northern Gulf of Alaska from Cape Spencer to Unimak Pass includes the following: (1) descriptions of and results of demersal resource assessment surveys for pandalid shrimps during the period of 1971-1976; and (2) description of an results of demersal resource assessment surveys in 1961-1962 and 1973-1976. (See also W79-01818) (Sinha-OEIS)
W79-01820

DEMERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM CAPE SPENCER TO UNIMAK PASS 1948 - 1976. A HISTORICAL REVIEW. VOLUME 3,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
L. L. Ronholt, H. H. Shippen, and E. S. Brown.
NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 2, Biological Studies, June 1978. p 624-955.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, Fish, Shellfish, Fisheries, Water quality, Alaska, *Outer Continental Shelf, *Gulf of Alaska, *Resource availability, Environmental assessment, Demersal fisheries, Petroleum development.

Volume 3 of the report on the area which includes the continental shelf and upper slope in the northern Gulf of Alaska from Cape Spencer to Unimak Pass continues the description of an results of demersal resource assessment surveys in 1961-1962 and 1973-1976 and a comparison of the demersal resource assessment survey results obtained in 1961-1962 with those obtained in 1973-1976. (See also W79-01818) (Sinha-OEIS)
W79-01821

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL. 3. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administrations, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Final Reports of Principal Inves

Descriptors: *Water pollution effects, *Baseline studies, Resources development, Eators, Vol 3, Biological Studies, June 1978.

Three final reports on baseline studies of the aquatic fauna and ecology of the Alaskan Continenta Shelf which assess the environmental effects of petroleum developments in that area are compiled in this volume. Titles are: Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska; Reconnaissance of the Intertidal and Shallow Subtidal Biotic Lower Cook Inlet; and Airborne Multispectral Mapping of the Intertidal Zone of Southern Alaska. (See also W79-01823 thur W79-01825) (NOAA)
W79-01822

COMMUNITY STRUCTURE, DISTRIBUTION, AND INTERRELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Oregon State Univ., Corvallis.
J. A. Wiens, D. Heinemann, and W. Hoffman.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 3, Biological Studies, June 1978. P 1-175, 58 fig, 24 tab, 55 ref.

Descriptors: *Baseline studies, *Water pollution effects, *Environmental effects, *Birds, Aquatic birds, Ecosystems, Alaska, Resources development, *Outer Continental Shelf, Gulf of Alaska, Petroleum development, Environmental assessment, Feeding flocks, Aves.

A standardized method for transect censusing of marine birds from shipboard at sea is described. All birds seen in an arc of 90 degrees, from the bow to one beam, are recorded over 15-30 min transect runs. For each sighting, the number of birds, species, distance, the angle from the transect line to the birds, and the direction of flight of flying birds are recorded. The various methods of transect-based density estimation are considered, the major findings of studies of marine bird distribution and abundance in the Gulf of Alaska are detailed, and the patterns of organization typifying mixed species feeding flocks in this region are described. Views regarding the influences of petroleum development on the populations and population attributes are evaluated. (See also W79-01822) (Sinha-OEIS)
W79-01823

RECONNAISSANCE OF THE INTERTIDAL AND SHALLOW SUBTIDAL BIOTIC LOWER COOK INLET,
Dames and Moore, Homer, AK.
D. C. Lees.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 3, Biological Studies, June 1978. p 179-506, 24 fig, 35 tab, 15 ref.

Descriptors: *Baseline studies, *Surveys, *Intertidal areas, Water resources, Benthos, Biota, Alaska, Geological surveys, *Outer Continental Shelf, Cook Inlet, Resources management, Airborne surveys, Subtidal areas, Petroleum development.

A reconnaissance survey of the intertidal and shallow habitats of lower Cook Inlet was conducted during May, June, July and August 1976. This survey comprised an aerial reconnaissance of the west side of the inlet and examination of several sites in representative habitats in the intertidal and shallow subtidal zones on both sides of the inlet. Species compositions and complexity of the biotas vary distinctly by substrate. The intertidal faunal assemblages were basically dominated by the same species, but their diversity, robustness and maturity differed dramatically. If the benthic assemblages of Cook Inlet are divided into export systems (producing more plant material (energy) than required to maintain their faunal assemblages) and inport systems (producing less plant material than necessary to support their faunal assemblages and therefore importing plant material), an interesting and important pattern is observed. The water circulation regime is certainly sufficiently dynamic to facilitate the transport of plant materials to import systems. The apparent patterns in the distribution of import and export assemblages are important in understanding the inter-relationships of the Cook Inlet system and should provide some very useful tools in planning resource management and petroleum development in lower Cook Inlet. (See also W79-01822) (Sinha-OEIS)
W79-01824

AIRBORNE MULTISPECTRAL MAPPING OF THE INTERTIDAL ZONE OF SOUTHERN ALASKA,
Environmental Research Inst of Michigan, Ann Arbor. Infrared and Optics Div.
N. E. G. Roller, and F. C. Polcyn.
In: NOAA/ERL Outer Continental Shelf Environmental Assessment Program, Final Reports of Principal Investigators, Vol 3, Biological Studies, June 1978. p 507-619, 30 fig, 9 tab, 7 ref. 03-7-022-35208.

Descriptors: *Mapping, *Intertidal areas, Water resources, *Surveys, *Baseline studies, Alaska, Vegetation, Algae, *Outer Continental Shelf, *Airborne surveys, Petroleum development.

Multispectral analysis was performend on a data set collected by low flying aircraft at three sites in the Gulf of Alaska, i.e., Zaikof Bay, Latouche Point and Cape Yakatadga for the purpose of mapping intertidal algal communities. Both supervised and unsupervised processing procedures were employed. It is possible to separate vegetation into broad spatial zones representing either species of algae of species associations or simply vegetation density classes. Clustering techniques represent the most effective way to extract training signatures. A minimum of four spectral bands is needed to achieve the recognition performance levels demonstrated in the study. Two channels in the visible (green and red), one in the near-infrared region and one in the thermal region were found most useful. A hypothetical intertidal survey of 1200 miles of Alaska shoreline is outlined with summaries of data collection and processing costs given for the mission using optimum spectral bands. (See also W79-01822) (Sinha - OEIS)
W79-01825

EFFECTS OF THERMAL DISCHARGE UPON A SUBARCTIC STREAM,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5B.
W79-01898

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATIONAL AREA,
Alaska Univ., Fairbanks. Inst. of Water Resources.
J. D. LaPerriere.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 385, Price codes: A03 in paper copy, A01 in microfiche. Report IWR-90, June 1978. 21 p, 6 fig, 2 tab, append. OWRT B-026-ALAS(2), 14-31-0001-4056.

Descriptors: Lakes, *Productivity, *Morphology, *Plant growth, *Nutrients, *Algae, Fisheries, *Alaska, *Recreation, Regression analysis, Tropic levels, *Morphoedaphic indices(Lakes), Tanana Lakes(Alas).

Results of work on two different lake areas, each a recreational focus for a large city in Alaska are presented. The productivity of these lakes has been classified according to their morphoedaphic index (MEI). This is the ratio between an edaphic (effects due to soil) factor usually measured as total dissolved solids (total residues), and a morphometric parameter, namely mean depth. Shindler's model for a particular morphoedaphic index, which is the ratio of the area of the lake and its watershed to the lake volume, was applied to data taken at the Tanana Lakes near Fairbanks. The regressions of various algal growth parameters with Schindler's index gave insignificant r's. This is likely due to the small variation in these parameters between the lakes. It is also likely due to the fact that any morphoedaphic index is most likely to regress strongly with measurements of the total production of a trophic level from lake to lake, and algal production is only a fraction of total primary production in these lakes.
W79-01900

ECOLOGY AND PATHOLOGY OF WILDLIFE IN RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT - PHASE I,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
R. G. Anthony, F. B. Samson, P. J. Glantz, D. C. Kradel, and H. Rothenbacher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 366, Price codes: A09 in paper copy, A01 in microfiche. Inst. for Research on Land and Water Resources, University Park, PA Research Project Technical Completion Rpt. August 1978. 189 p, 15 fig, 58 tab, 11 ref. OWRT B-084-PA(2), 14-34-0001-6113.

Descriptors: Habitats, *Pennsylvania, *Mosquitoes, *Heavy metals, *Wastewater irrigation, E. coli, *Chlorinated sewage effluents, *Wildlife, Ecology, *Arthropods, *Habitat alteration, *White-footed mice, *Forest habitat, Condition indices, Blood profiles, Cottontail rabbit, Arbovirus activity, Coccidiosis, Helminth infections, Meadow vole, Passerine birds.

In Pennsylvania, forest habitats irrigated with wastewater showed an increase in the abundance of vegetation at the lower layer. Arthropod abundance in this layer also increased. The overall abundance of passerine birds increased in the irrigated aspen-pine-shrub type, but decreased in the mixed-oak. The accumulation of heavy metals in voles inhabiting the reed canarygrass field was not significant, and concentrations of lead and cadmium in mice inhabiting the wastewater-treated forest plots were not considered hazardous. The prevalence of antibody for arboviruses ranged from 0 to 3.5 percent in rabbits from areas which will be included in the expansion of the wastewater-irrigation system. Five of the arboviruses being transmitted are potential pathogens to humans and borne primarily by mosquitoes. Body measurements, samples of blood, and organ tissues from wild rabbits were collected from the 500-acre area scheduled for future irrigation and a reference area. The level of coccidiosis and the helminth infections of rabbits did not seem to be markedly influenced by age, sex, season, or area. A new species of coccidia was described. Weight/length ratios of body size and population estimates of white-footed mice and meadow voles were obtained during 1974 to 1977. (Sink-Penn St)
W79-01902

CITRIC ACID ENHANCEMENT OF COPPER SULFATE TOXICITY TO BLUE-GREEN ALGAE AND OTHER NUISANCE ORGANISMS,
Missouri Univ.-Kansas City. Dept. of Biology.
M. S. Stern, D. H. Stern, and L. L. Ray.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 490, Price codes: A05 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, University of Missouri, Columbia Completion Report, November 30, 1978. 84 p, 13 fig, 23 tab, 56 ref. OWRT A-099-MO(2), 14-34-0001-7053, 7054 and 8027.

Descriptors: *Copper sulfate, *Citric acid, Algae, Algicides, Toxicity, Toxicity tests, *Cyanophyta, Microcystis, Aphanizomenon.

Copper toxicity tests were carried out using two species of blue-green algae, Aphanizomenon flos-aquae and Microcystis aeruginosa. Copper concentrations of 300 microgram/liter or higher inhibited the growth of Aphanizomenon. The addition of 600 microgram Cu++/liter was the minimum copper concentration necessary to inhibit Microcystis growth over a 14-day experimental period. Copper solubility and cupric ion toxicity were enhanced by the addition of citric acid. Citric acid had no adverse effects on the algicidal properties of copper sulfate. A ratio of citric acid at eight times the weight of copper sulfate pentahydrate at a copper concentration of 500 microgram/liter (8:1 citrate-copper sulfate mixture) was inhibitory to Microcystis growth over a 14-day period, whereas the addition of 500 microgram Cu++/liter alone was not. The 8:1 mixture had the same effects as the addition of 600 microgram Cu++/liter. The increased cupric ion toxicity was not due to a pH effect.
W79-01906

HARRY'S BROOK - A SURVEILLANCE REPORT OF PHYSICAL CONDITIONS AND BIOLOGICAL HEALTH,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., A. W. McIntosh, and J. M. DiLouie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 489, Price codes: A03 in paper copy, A01 in microfiche. Partial Technical Completion Report, September 1978. 38 p, 9 fig, 3 tab, 8 ref, append. OWRT A-048-NJ(4), 14-34-0001-8032.

Descriptors: *Water pollution, *Environmental effects, Water quality, Erosion, Flood plain management, Bank erosion, Urban drainage, *New Jersey, *Harry's Brook(NJ), *Stream surveillance, *Biological health of streams.

Streams in urbanizing areas are subject to a variety of stresses produced by the processes of growth; most of the resulting changes are environmentally adverse. Unfortunately, small streams are so numerous and conditions in them may change so rapidly that conventional monitoring networks cannot deal with them. The condition of these streams may be more accurately monitored by biological evaluations than by measurements of the usual water quality parameters. A surveillance of Harry's Brook in Princeton Township, New Jersey, was conducted to evaluate the biological health of the stream, the pollution sources to which it is subject and certain other physical conditions relevant to management. The overall quality of the stream appeared good, although sampling of the benthic macroinvertebrate community in riffles indicated low numbers of both taxa and organisms, although the caddisfly larva Hydropsyche sp. and Cheumatopsyche sp. were found in large numbers in several riffles. Both bank and channel erosion were common, particularly along the main stem of Harry's Brook. As urbanization continues in upstream sections, erosion problems may be expected in these areas.
W79-01907

EFFECTS OF NUTRIENT ENRICHMENT OF A SALT MARSH ON DIATOM COMMUNITIES,
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
M. J. Sullivan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 388, Price codes: A03 in paper copy, A01 in microfiche. Report, 1978. 40 p, 1 fig, 10 tab, 17 ref, 6 pl. OWRT A-114-MISS(1). 14-34-0001-8026.

Descriptors: *Water pollution effects, *Diatoms, *Nitrogen, *Phosphorus, *Salt marshes, Nutrients, Soil algae, Eutrophication, Bioindicators, Biological communities, *Mississippi, Water quality, Community structure, *Graveline Bay Marsh(Miss), Spartina, Nitzschia, Navicula.

Edaphic diatoms were collected on a seasonal basis from a monotypic stand of Spartina alterniflora Loisel. on Graveline Bay Marsh, Mississippi; the marsh surface had been enriched with inorganic nitrogen (N) and/or phosphorus (P). During the winter collection, P and N-P enrichment significantly decreased species diversity (H') while N and P enrichment significantly decreased the number of taxa in a sample. Of the 87 taxa encountered, examination of the distributions of the more abundant ones revealed that nutrient enrichment neither introduced new taxa nor eliminated preexisting taxa. A 2-way ANOVA (treatment x date) of the relative abundances of the 12 most abundant taxa showed that only main effects were significant and only two taxa were significantly affected by the treatments. Nitzschia obsidialis Hust. responded favorably to P enrichment and N. obtusa W. Sm. to N enrichment. Structural similarity between selected pairs of edaphic diatom communities was quantified using a similarity index (SIMI) and values were exceedingly high. The aerial yield of S. alterniflora was unaffected by any of the treatments. In view of the few significant effects of nutrient enrichment found, it was concluded that the edaphic diatom community studied was not subject to N or P limitation.
W79-01982

FACTORS AFFECTING SEDIMENT PHOSPHORUS RELEASE IN LQKE CARL BLACKWELL, OKLAHOMA,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
M. H. Bates, and N. J. Neafus.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 602, Price codes: A03 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Oklahoma State University Final Technical Completion Report, 1978. 34 p, 8 fig, 2 tab, 44 ref. OWRT A-074-OKLA(1).

Descriptors: *Orthophosphates, *Lake sediments, *Oklahoma, Lakes, *Lake Carl Blackwell(Okla), *Phosphorus, Phosphates, Mixing, Microorganisms, Aerobic conditions, *Anaerobic conditions, Nutrients, Water pollution effects.

A laboratory study was conducted to determine the effects of mixing, microorganisms and aerobic and anaerobic conditions on the release of soluble orth-phosphate from lake sediments obtained from Lake Carl Blackwell, Oklahoma. Release was enhanced by mixing, the presence of microorganisms and anerobic conditions. Phosphorus release under aerobic conditions did occur in the experimental systems. However, anaerobic release was greater. The concentration of phosphorus in the overlying water as the result of release from the sediments exceeded, in many cases, the values found in the literature for the limiting concentration of phosphorus for an aquatic system. Phosphorus released from the sediments in Lake Carl Blackwell could support substantial aquatic growth even in the absence of any external nutrient contribution.
W79-01984

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Coll. of Engineering.
For primary bibliographic entry see Field 5G.
W79-01988

THE EFFECTS OF ADVECTION-DIFFUSION PROCESSES ON THE EUTROPHICATION OF LARGE LAKES, A HYPOTHETICAL EXAMPLE: LAKE SUPERIOR,
Canada Centre for Inland Waters, Burlington (Ontario).
E. Halfon, and D. C. L. Lam.
Ecological Modelling, Vol. 4, No. 2-3, p 119-131, February, 1978. 6 fig, 2 tab, 8 ref.

Descriptors: *Lake Superior, *Advection, *Diffusion, *Eutrophication, *Phosphorus, *Water pollution effects, Great Lakes, Lakes, Nutrients, Spatial distribution, Oligotrophy, Simulation analysis, Model studies, Mathematical models, Hydrodynamics, Primary productivity, Water circulation, Stratification, Mixing, Upwelling, Water temperature, Solar radiation, Algae, Forecasting.

Effects of a hypothetical tenfold increase of phosphorus loading to oligotrophic Lake Superior are modelled, considering both dispersion mechanisms and biological processes which determine spatial movements of the phosphorus. These movements are simulated using computed currents from a three-dimensional hydrodynamic model. A biological submodel describes phosphorus dynamics and primary production in each grid cell of 20 x 20 km. Increased phosphorus loading is applied to two locations in the lake: (1) a semi-closed bay at the southwestern end of the lake, and (2) an open shore with strong local currents along the lake's northwestern edge. The model conveys a number of important temporal and spatial scenarios, which may form some of the fundamental blocks for considering practical local and lakewide eutrophication problems. Consistent with other studies, it is concluded that a nutrient-impoverished system like Lake Superior's with a low half-saturation constant (K sub s) and limited storage capacity, is very sensitive to pollution, and once perturbed, the recovery time is very lengthy. In Lake Superior K sub s related to phosphorus uptake is very low (0.78 micrograms P/liter), rendering the model sensitive to increased loading. The analysis included effects on primary production of water circulation, diffusion, thermal stratification, horizontal and vertical diffusion, mixing, upwelling and downwelling, temperature, and sunlight. Weaknesses of the model are discussed. (Lynch-Wisconsin)
W79-01993

A STUDY OF PARAMETER ESTIMATION PROCEDURES OF A MODEL FOR LAKE PHOSPHORUS DYNAMICS,
Wiezmann Inst. of Science, Rehovoth (Israel). Dept. of Isotope Research.
S. Lewis, and A. Nir.
Ecological Modelling, Vol. 4, No. 2-3, p 99-117, February, 1978. 6 fig, 7 tab, 27 ref, 2 append.

Descriptors: *Phosphorus, *Computer models, *Parameters, *Estimating, *Methodology, *Eutrophication, Ecosystems, Lakes, Model studies, Simulation analysis, Algorithms, Greifensee(Switz), Switzerland), Monte Carlo method, Self-Consistency Test, Nutrients.

A method is presented for evaluating parameter estimation in lake ecosystem modelling, using for illustration data from Greifensee, Switzerland, and a reduced version of a complex eutrophication model of lake phosphorus dynamics. The method, called the Self-Consistency Test, assigns a weight to parameter self-consistency using additional simulated data. Such characteristic features of many ecosystem models as complexity, time-variability, nonlinearity, and sparsity of data demand a reliable parameter estimation startegy to reinforce confidence in model results. The reduced model is used as a basis for a progressive investigation of the effectiveness of several possible criteria for parameter estimation; the last step uses Monte Carlo techniques to supplement the sparse data in order to evaluate the uniqueness and robustness of the estimates as a function of the number of data. Parameter estimation algorithms used at present for nonlinear, multidimensional models are unable to overcome the problem of multimodality of the objective function, and the choice of objective function and sparsity of data can contribute to ambiguous parameter estimates. Although one set of parameters is proposed here, the Self-Consistency Test has certain shortcomings and there are problems in generalizing to other systems: (1) the preferred parameter set may not objectively be the best set; (2) the self-consistency checks could turn into circular arguments, and (3) initial values of parameters can determine the results of the estimates. (Lynch-Wisconsin)
W79-01994

MEASUREMENTS OF PHYTOPLANKTON-PROTEIN CONTENT WITH THE HEATED BIURET-FOLIN ASSAY,
USV Pharmaceutical Corp., Tuckahoe, NY.
For primary bibliographic entry see Field 5A.
W79-01995

MARINE ALGAL VEGETATION IN SHALLOW WATER AROUND THE DANISH ISLAND OF SALTHOLM, THE SOUND,
Institut for Sporeplanter, Copenhagen(Denmark).
A. Kristiansen.
Botanisk Tidsskrift, Vol. 72, No. 4, p 203-226, 1978. 12 fig, 7 tab, 33 ref.

Descriptors: *Saltholm(Denmark), *Marine algae, *Floral lists, *Shallow water, *Littoral, Denmark, Baltic Sea, Islands, Algae, Salinity, Coasts, Brackish water, Cyanophyta, Rhodophyta, Phaeophyta, Chlorophyta, Seasonal, Classification, Epiphytes, Fucus vesciculosus.

Seventy-two species of marine algae were collected from shallow water (0-.75 m) within 300 m of the coastline of 7 x 2.5-km Saltholm Island, Denmark, in the Sound. During the survey (May-August 1976) seven sites were studied, and species belonging to Cyanophyceae, Rhodophyceae, Phaeophyceae, and Chlorophyceae were identified. An annotated list of the species, and tables relating species distribution to site, depth, and substrate are given. Surface water temperatures (five-day averages) ranged from 0.9-19.6C over 1976. Salinity fluctuates greatly each day, averaging 11-13%. Water level is very changeable. The supralittoral zone is only weakly developed on Saltholm, and most of the eulittoral zones were without vegetation down to a depth of about 15 cm. In the sublittoral, at a depth of 20-30 cm the dominant Fucus vesciculosus plats were typically covered with about 15 species of epiphytic alge, especially Elachist, Philayella, Ectocarpus, Spongonema, Dictyosiphon, Ceramium, and Polysiphonia. On the lower parts of Fucus (at a depth of 30-35 cm) few epiphytes were found, and the border of the sublittoral is therefor established at that depth. With increasing depth Fucus grows taller and broader, and epiphyte quantity increases, with an increasing abundance of red algae and occurrence of large individuals (10 cm or more). Saltholm's marine algal flora can be considered an outpost of the shallow water flora of the brackish Baltic Sea. Five species new to Denmark were recorded. (Lynch-Winsconsin)
W79-01996

NITROUS OXIDE IN THE OXYGEN MINIMUM OF THE EASTERN TROPICAL NORTH PACIFIC: EVIDENCE FOR ITS CONSUMPTION DURING DENITRIFICATION AND POSSIBLE MECHANISMS FOR ITS PRODUCTION,
Oregon State Univ., Corvallis. School of Oceanography.
Y. Cohen, and L. I. Gordon.
Deep-Sea Research, Vol. 25, No. 6, p 509-524, June, 1978. 8 fig, 2 tab, 58 ref. NR083102, N00014-76-C-0067.

Descriptors: *Nitrous oxide, *Nutrients, *Pacific Ocean, *Denitrification, *Sinks, *Ozone, Oxygen, Oceans, Tropical regions, Nitrogen, Nitrification, Oxygen depletion, Anaerobic conditions, Sea water, Eastern Tropical North Pacific Ocean, Fertilizers, Fossil fuels, Atmosphere, Nitrites, Saturation.

The eastern tropical North Pacific Ocean (ETNP) was found to be a net source for atmospheric nitrous oxide, though of small magnitude (0.14 pg N20/sq cm/sec), and nitrifications may be the most important mechanism for nitrous oxide production in the ETNP. Nitrous oxide plays a major role in controlling stratospheric ozone levels, and increasing use of fertilizers and combustion of fossil fuels is likely to promote ozone depletion. It is thus important to identify and evaluate all significant natural sources and sinks for atmospheric nitrous oxide. This study, which investigated nitrous oxide, oxygen, and nutrient distributions in the ETNP, showed biochemical nitrous oxide consumption around the core of oxygen minimum where denitrification takes place. Subsurface nitrous oxide minima were found at stations where intermediate waters contained near-zero oxygen levels and well-developed secondary nitrite maxima, characteristic of denitrification. Surface waters were saturated and average of 110% with nitrous oxide relative to a marine air content of 287 ppbv. Except for the oxygen-deficient layer where nitrous oxide minima were found, nitrous oxide was highly supersaturated at all stations from just below the mixed layer to about 1000 m. Supersaturations varied from 224-600% in shallow waters above the base of the pycnocline, and from 120-250% in waters below 1000 m. Denitrification is not important in nitrous oxide production in seawater, unlike the situation in soils. (Lynch-Wisconsin)
W79-01997

MATHEMATICAL MODELS OF DISSOLVED OXYGEN CONCENTRATION IN FRESH WATER,
Stevens Inst. of Tech. Hoboken, NJ.
L. K. Wang, D. Vielkind, and M. H. Wang.
Ecological Modelling, Vol. 5, No. 2, p 115-123, July, 1978. 2 fig, 2 tab, 15 ref.

Descriptors: Freshwater, Streams, *Mathematical models, *Waste water disposal, *Self-purification, *Dissolved oxygen, Effluents, Biochemical oxygen demand, Water pollution effects, Water pollution control, Oxygen sag, Oxygen depletion, Anaerobic conditions, Computer programs, Model studies, Biological properties, Water quality standards, Equations, Organic matter.

Modsel are presented for biological reactions to anaerobic conditions sand for dissolved oxygen saturation concentration in freshwater, and a brief description is given of the environmetal engineering significance of stream self-puriication, present stream water quality standards on DO concentation, and the solubility of DO in water. The DO saturation concentration model is useful for determining DO deficits, critical DO concentration, and allowable DO drop in a stream receiving wastewater. Equations for calculating the critical distance (X sub c), the time required to reach the critical distance (T sub c), and the critical DO dificit (D sub c) are given. Unstable organic matter in wastewater accelerates microbiological oxidation and thus rapidly reduces DO concentration. In this paper the effluent is assumed to have low nutrient content and to be nontoxic and biodegradable. Biochemical oxygen demand of the effluent is initially exerted at a rate higher than the atmospheric reaeration rate at the water surface. The DO level decreases, finally reaching the critical point X sub c at which the rte of oxygen utilized for waste decompostion equals the rate of atmospheric reaeration. Further downstream the reaeration rate is greater than the BOD exertion rate and DO begins to increase and eventually the normal cycle is re-established (self-purification). At DO 1.0 mg/1 conditions become anoxic/anaerobic, resulting in hydrogen sulfice and organic sulfide odors, coloration; and destruction of fish and other organisms. (Lynch-Wisconsin)

W79-01998

EUTROPHICATION OF WATER BODIES: INSIGHTS FOR AN AGE-OLD PROBLEM,
Texas Univ.-Dallas, Richardson.
G. F. Lee, W. Rast, and R. A. Jones.
Environmental Science and Technology, Vol. 12, No. 8, p 902-908, August, 1978. 6 fig, 1 tab, 6 ref.

Descriptors: *Eutrophication, *Vollenweider models, *Nutrients, *Phosphates, *Nutrient removal, *Water pollution control, Water pollution effects, Water quality control, Phosphorus, Depth, Hydraulic residence time, Lakes, Pollutants, Point pollution, Nonpoint pollution, Great Lakes, Water pollution sources, Organization for Economic Cooperation and Development, Water management(Applied), Waste water treatment.

This report surveys the current state of information on the relationship between phosphate inputs to a water body and eutrophication-related water quality problems. Research of the past 10-15 years has established phosphorus as a key element controlling planktonic algal growth in freshwater; in marine waters nitrogen is generally the controlling factor. While past eutrophication control measures have been directed primarily toward control of phosphorus from point sources (especially domestic wastewater), it is now clear that for many water bodies phosphorus from nonpoint sources must also be controlled if acceptable water quality is to be restored. This paper includes: (1) a discussion of eutrophication processes; (2) definitions relating to lakes and lake enrichment; (3) description of the Vollenweider model for determining critical phosphorus laods to lakes (which relates areal phorphorus loading to the ratio of mean depth:hydraulic residence time; (4) identification of phosphorus sources; (5) overview of the OECD Eutrophication Study; (6) limnological measurement methods; and (7) effects of phosphours remova. Phosphorus can be reduced to a concentration of about 1 mg P/l in domestic wastewater effluent at a cost of less than $.01/person/day. Reduction of phosphorus loading can significantly decrease oxygen depletion rate and algal biomass and increase water clarity. It is well-established that for many water bodies internal phosphorus loading is small, and most bioavailable phosphorus is due to external sources. (Lynch-Wisconsin)
W79-02000

5D. Waste Treatment Processes

PREDICTING THE ANAEROBIC DEGRADATION OF ORGANIC CHEMICAL POLLUTANTS IN WASTE WATER TREATMENT PLANTS FROM THEIR ELECTROCHEMICAL REDUCTION BEHAVIOR,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W79-01539

EFFICIENCY AND EQUITY IN PRICING LOCAL PUBLIC SERVICES: THE CASE OF WASTEWATER,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
D. Peterson.
Available from University Microfilms International, Ann Arbor, MI 48106. Ph.D. thesis, 1977. 240 p, 12 fig, 44 tab, 116 ref, 2 append. OWRT B-087-WIS(4), 14-31-0001-4139.

Descriptors: *Cost sharing, Cost analysis, *Sewage treatment, *Waste water treatment, Management, Wisconsin, Cost-benefit analysis, *Madison Metropolitan Sewerage District(Wisc).

The Madison Metropolitan Sewerage District and the Madison, Wisconsin urbanized area were chosen for a data base to demonstrate the pricing model. The objective of the pricing model is to maximize the aggregate consumer surplus of all households which use public wastewater services subject to the constraint that the MMSD breaks even; i.e. does not incur a loss. The residential users of the district were divided into three distinct population density groups to reflect the fact that population density is a key factor in determining the cost of service. Using the household demand characteristics for wastewater services, the distribution of rental values for housing services as a proxy for wealth, the model was solved to yield a series of optimal prices for each population density group. The normative decision parameter, which explicitly sets forth the value judgments concerning household welfare, determines which price of the series best meets the values of the community. Four alternative pricing rules were compared with the optimal price series to evaluate the welfare effects. In most cases, if equity is a strong social objective, the optimal price is equal to average cost, not marginal cost. Marginal cost pricing is optimal only in the sense that equity objectives are ignored or do not matter. Even with cost pricing, however, a distinction must be made among user groups to avoid the welfare losses that result from charging a uniform price over time and space.
W79-01544

TRICKLE-BED REACTOR PERFORMANCE, PART I: HOLDUP AND MASS TRANSFER EFFECTS,
California Univ., Davis. Dept. of Chemical Engineering.
S. Goto, and J. M. Smith.
AIChE Journal, Vol. 21, No. 4, July, 1975, p. 706-713. 9 fig, 1 tab, 22 ref. (California Water Resources Center Project UCAL-WRC-W-392). OWRT A-051-CAL(2).

Descriptors: *Chemical reactions, *Mass transfer, Coefficients, Trickle-bed reactors, *Gas-to-liquid transfer.

Liquid holdup and mass transfer rates were measured in a 2.58-cm I.D. tube, packed with glass beads and granular CuO:ZnO catalyst or beta-naphthol particles, and operated as a trickle bed. Gas-to-liquid (water) transport coefficients were determined from adsorption and desorption experiments with oxygen at 25C and 1 atm. Liquid-to-particle mass transfer was studied using beta-naphthol particles. Holdup and both mass transfer coefficients were unaffected by gas flow rate but increased with liquid rate. The data were correlated with equations that could be used for predicting mass transfer coefficients at high temperatures and pressures for use in the reaction studies reported in Part II. (See also W79-01566) (Snyder-Calif, Davis)
W79-01565

TRICKLE-BED REACTOR PERFORMANCE, PART II: REACTION STUDIES,
California Univ., Davis. Dept. o
S. Goto, and J. M. Smith.
AIChE Journal, Vol. 21, No. 4, July, 1975, p. 714-720. 11 fig, 3 tab. (California Water Resources Center Project UCAL-WRC-W-392). OWRT A-051-CAL(3).

Descriptors: *Water purification, *Oxidation, Mass transfer coefficients, Filters, *Trickle-bed reactors, *Reaction, Kinetics, Waste water treatment, Formic acid.

Dilute solutions (132 ppm) of formic acid in water were oxidized with air in a trickle-bed reactor at 212C to 240C and 40 atm. Particles 0.291 and 0.0541 cm in diameter, prepared from a commercial CuO:AnO catalyst, were used to provide a model system for studying water purification by catalytic oxidation. Differential reactor runs were made to measure the global rate of reaction. These data were compared with predicted rates from the known intrinsic kinetics and intraparticle diffusivities, and the mass transfer coefficients were measured in Part I. High conversion (of formic acid) data were also obtained in order to test models for trickle-bed reactors. Experimental conversions agreed reasonably well (within 10%) with predicted values based upon intrinsic kinetics and the several transport rates. Axial dispersion was found to be less important than gas-to-liquid mass transfer and intraparticle diffusion. In our laboratory studies (reactor I.D. = 1 in.) careful arrangements were made to obtain nearly uniform distribution of liquid over the reactor cross section. Hence effects of maldistribution, which may be important in large-scale reactors, were minimized. (See also W79-01565) (Snyder-Calif, Davis)
W79-01566

MASS TRANSFER IN PACKED BEDS WITH TWO-PHASE FLOW,
California Univ., Davis. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 2K.
W79-01567

CATALYTIC OXIDATION OF FORMIC ACID IN WATER. INTRAPARTICLE DIFFUSION IN LIQUID-FILLED PORES,
California Univ., Davis. Dept. of Chemical Engineering.
G. Baldi, S. Goto, C.-K. Chow, and J. M. Smith.
Ind. Eng. Chem., Process Des. Develop., Vol. 13, No. 4, 1974, p 447-452. (Univ. of California Water Resources Center Project UCAL-WRC-W-392). OWRT A-051-CAL(1).

Descriptors: *Water pollutant treatment, Waste water treatment, *Oxidation, Formic acid, Diffusion, Catalytic oxidation, Porosity, Catalysts.

Liquid-phase oxidation with a solid catalyst provides a potential method for the removal of dissolved pollutants. A commercial CuO-ZnO catalyst was found to be effective for converting dilution solutions of a test pollutant, formic acid, to carbon dioxide at 200-240C. To prevent the presence of a vapor phase the operating pressure was maintained at 40 atm. Rate measurements showed the reaction to be first order with respect to both dissolved oxygen and formic acid concentrations. In the presence of formic acid solutions the catalyst could be reduced when the oxygen concentration was low and oxidized at higher oxygen concentrations. Possibly the activity of the catalyst is explained by an oxidation-reduction mechanism. Measurements with large catalyst particles (0.477-cm diameter) showed severe retardation of the rate; effectiveness factors as low as 0.11 were obtained. Tortuosity factors (approximately 1.0) were lower than would be expected for gas-filled pores. The intrinsic activation energy was about 37 kcal/mol while the apparent value for 0.477-cm particles was 24 kcal/mol. (Snyder-Calif, Davis)
W79-01572

***VEHICLE WASHING* OPERATIONS AND WASTEWATER DISCHARGES, FORT DRUM, NY -- FINDINGS AND RECOMMENDATIONS,**
*Construction Engineering Research Lab., Champ*aign, IL.
R. J. Filecia, L. J. Benson, K. A. Conley, and J. *E. Matherly.*
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 173, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. E-80, June 1976. 47 p, 12 fig, 12 tab.

Descriptors: *Waste water treatment, *Surveys, *Costs, *Design, *Technology, Water pollution treatment, Fort Drum, New York, Army vehicles, Sedimentation, Filtration, Oily water, Oil wastes.

A survey was carried out of Army vehicle washing facilities, and waste water discharges resulting from these activities at Fort Drum, New York. On the basis of the survey data and information supplied by post personnel, a concept design and cost estimates were prepared for a new consolidated washrack facility to replace existing facilities. The recommended design incorporates hand-held, high pressure/low volume wash hoses for tracked vehicles and fixed nozzle drive-through facilities for wheeled tactical equipment. The proposed centralized waste water treatment system consists of a sedimentation basin equipped for mechanical free oil removal, followed by filtration through a polishing filter. (Majtenyi-IPA)

W79-01573

FEASIBILITY OF RECYCLING LAUNDRY WASTEWATERS AT MILITARY QUARTERMASTER LAUNDRIES,
Army Facilities Engineering Support Agency, Fort Belvoir, VA. Research and Technology Div.
S. W. Ford.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 705, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. USAFESA-RT-2016, March 1977. 43 p, 8 fig, 40 ref.

Descriptors: *Waste water treatment, *Water pollution, *Recycling, *Cost analysis, Laundries, Coagulation, *Flotation, Chemical reactions, Evaluation.

A study was performed to determine if reclaiming laundry waste waters at military quartermaster laundries would be economical. Several potential treatment systems were designed and evaluated, including chemical and physical methods, such as coagulation by aluminum sulfate, activated powdered carbon with a polyelectrolyte, and induced air flotation. Usage, costs, designs, comparisons, and assumptions are described in detail and an economic analysis was performed. It was concluded that laundry waste water recycling is currently uneconomical and there is no indication that present conditions will change dramatically enough in the near future to warrant future study of laundry practices. (Majtenyi-IPA)
W79-01574

EFFECT OF OZONE AND CHLORINE ON 3,4-BENZOPYRENE DURING THE DISINFECTION OF WATER (DEYSTVIYE OZONA I KHLORA NA 3,4-BENZPIREN PRIOBEZZARAZHIVANII VODY),
R. D. Gabovich, I. L. Kurinnyy, and Z. P. Fedorenko.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 408, Price codes: A02 in paper copy, A01 in microfiche. Gig. Naselennykh Mest., No. 8, p 88-91, 1969. Translated by Army Medical Intelligence and Information Agency, Washington, D.C., Translation No. USAMIIA-K-4566.

Descriptors: *Industrial wastes, *Chlorination, *Ozone, *Chemical wastes, Organic chemicals, Chemical reactions, 3,4-benzopyrene, Toxicity, Chemical analysis, Water quality control, Water pollution, Laboratory tests.

Experiments were carried out tracing the fate of 3,4-benzopyrene dissolved in water and subjected to different kinds of treatment common to drinking water supply systems. This compound was chosen as representing carcinogenic hydrocarbons known to be part of the pollution produced by coke and shale plants, oil refineries and gas works. Studies on the effect of chlorine on 3,4-benzopyrene revealed that the major products are 5-monochloro-2,4-benzopyrene which has not been studied for carcinogenicity and, to a lesser extent, 3,4-benzopyrene-5,8-quinone which is not carcinogenic. Chlorine in semibound form, for example as chloramine, was ineffective for reducing 3,4-benzopyrene concentration. Ozonation proved more effective than chlorination. It reduced 3,4-benzopyrene concentration by a factor of 10 to 50 where chlorination reduced concentration only by a factor of 5 to 10. However, it was concluded that water cannot be completely freed from benzopyrene under practical conditions even after chlorination for 0.5 to 2 hours or ozonation for 3 to 5 minutes. (Majtenyi-IPA)
W79-01575

A GAMMA-RAY COUNTING APPARATUS FOR EVALUATING THE FALLOUT REMOVAL EFFECTIVENESS OF REVERSE-OSMOSIS WATER PURIFICATION SYSTEMS,
Ballistic Research Labs. Aberdeen Proving Ground, MD.
G. Thomson, S. Schiller, J. Goshorn, E. Kaufman, and C. Hollandsworth.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 749, Price codes: A02 in paper copy, A01 in microfiche. Report No. BRL-MR-2746, May 1977. 23 p, 6 fig.

Descriptors: *Radioactive wastes, *Radioactive techniques, *Gamma rays, *Radioisotopes, *Potable water, Iodine 131, Strontium 85, Cesium 134, Reverse osmosis, Monitoring, Laboratory tests, Water quality control, Water purification, Water pollution, Evaluation, Measurement, Equipment.

A gamma ray detection system for measuring concentrations of radioactive impurities and procedures for its calibration and use are described. The system is based on scintillation methods and emphasizes counting efficiency, calibration accuracy, and a minimum of sample preparation. It is capable of dose counting water samples in the range of activities from a few tens to a few millions of picocuries per liter in a time period of 30 minutes. Tests were carried out on samples containing three important isotokpes, iodine 131, strontium 90, ad cessium 137, which were processed through a reverse osmosis system. The attenuation of activity taking place as the stream was processed was monitored with an accuracy of a fraction of 1%. The accuracy of absolute dose level determinations was limited by the errors in the calibration standards at levels of a few thousand picocuries per liter and at lower levels, statistical uncertainty is dominant. (Majtenyi-IPA)
W79-01576

DEVELOPMENT OF TECHNIQUE FOR DETECTION OF LOW MOLECULAR WEIGHT CONTAMINANT IN PRODUCT WATER FROM WATER PURIFICATION OR WATER REUSE SYSTEMS,
Amicon Corp., Lexington, MA.
For primary bibliographic entry see Field 5A.
W79-01578

EXAMINATION OF THE PROBLEM OF RECUPERATIVE TREATMENT OF WASTE WATER IN THE CHEMICAL INDUSTRY (CONSIDERATII ASUPRA PROBLEMEI EPURARI RECUPERATIVE A APELOR REZIDUALE),
I. V. Robu.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 230, Price codes: A02 in paper copy, A01 in microfiche. Revista de Chimie (Bucharest), Vol 17, No. 10, p 627-635, 1966. 10 fig, 2 ref. Translated by Army Medical Intelligence and Information Agency, Washington, D.C. Translation No. USAMILA-K-7088.

Descriptors: *Industrial wastes, *Recycling, *Water pollution treatment, Distillation, Thiems equation, Chemical wastes, Organic wastes, Nitrobenzene, p-Nitrotoluene, Theoretical analysis, Laboratory tests, Fractional distillation, Azeotropes, Value engineering, Cost-benefit analysis, Costs, Pollution abatement, Technology.

The problem of waste water treatment in chemical plants is examined with emphasis on recuperative systems whereby hazardous substances which are difficulty soluble in water may be separated and reused. Cost effectiveness is considered, but major focus is on estimation of the degree of pollutant removal based on their physical properties. As an illustrative example, calculations were done for separations using a fractioning column having only a stripping section and heated by direct steam at atmospheric pressure. Equilibrium equations and curves were established for substances, such as nitrobenzene, which form azeotropes with water. These theoretical calculations yielded the number of theoretical plates needed of successful separation as well as steam consumption so that optimum design and economic efficiency could be determined. Using this method a highly favorable recovery of nitrobenzene was predicted. This prediction was verified in laboratory studies yielding 94% recovery. However, because fractionation at lower temperatures is advantageous, other experiments used column operating pressure of about 55 mm Hg to separate a water-p-nitrotoluene system at an average column temperature of 43 C. A recovery of 99% was obtained from a 0.1% solution of p-nitrotoluene. Diagrams of two recuperative treatment plats using this system at atmospheric pressure an vacuum are included which are currently being built in Romania. (Majtenyi-IPA)
W79-01579

UV-OZONE WATER OXIDATION/STERILIZATION PROCESS,
Westgate Research Corp., Marina del Rey, CA.
J. D. Zeff, R. Shuman, E. S. Alhadeff, J. Wark, and F. C. Farrell.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 609, Price codes: A10 in paper copy, A01 in microfiche. Final Report No. 1602. November 1976. 207 p, 33 fig, 43 tab, 1 append. DAMD 17-75C-5013.

Descriptors: *Water purification, *Waste water treatment, *Ultraviolet light, *Ozone, Recycling, Mathematical models, Organic chemicals, Microorganisms, Research and development, Disinfection, Treatment facilities, Laboratory tests, Pilot plants, Spacecraft, Technology.

An ultraviolet light-ozone system for destroying organic compounds and microorganisms in waste water suitable for use in the Army MUST Program and NASA Manned Spcecraft is described. Both laboratory tests and mathematical models were used in developing bench scale and pilot-plant scale systems. The organics of special interest were hydroquinone, pyrogallol, xylenol, urea, and sodium, acetate. Ethanol, glycerol, glycine, and acetic acid were evaluated also. The UV-ozone process was found to be more effective than either UV or ozone alone in destroying organics and microorganisms in various waters. Studies, using mathematical models, indicated that a Unit Reactor Module of 5 KW power for treating hospital composite, reverse osmosis permeate will occupy 5-ft 6-in by 2-ft 6-in and will weigh 750 lbs. This will include 36-inch UV lamps and operate at 3 to 5 psig pressure. The UV-ozone system for manned spacecraft capable of accomodating a crew of five would be 7-in by 8-in, weigh 12 lbs, and consume 36 Whrs/lb water. Detailed evaluations of equipment performance and capabilities are included and recommendations are made of further research, both chemical and mathematical. (Mjtenyi-IPA)
W79-01581

CLEAN UP MIXED WASTE STREAMS – THE TANK TRUCK WASHING EXAMPLE.
MITRE Corp., McLean, VA. METREK Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 557, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/9-77-007, and M77-2, April 1977. 10 p, 1 fig, 6 tab. 68-01-3188.

Descriptors: *Industrial wastes, *Waste water treatment, *Technology, *Water pollution control, *Tank trucks, Coagulation, Aeration, Filtration, Costs, Swedesboro, New Jersey, Water pollution, Separation techniques, Flotation, Hydrogen ion concentration, Sedimentation, Cost analysis.

A system of treating waste waters produced by the cleaning of tank trucks was developed and tested at the Swedesboro, New Jersey, terminal of Matlack Corp. Although tank truck cleaning produces only small quantities of waste water, the wide range of cargoes carried results in a high degree of variability in pollutional content as indicated by a table showing 21 tanker cargoes. To deal with such wide ranging pollutants, the system uses seven separate operations: oil separation, air flotation, chemical coagulation and pH adjustment, equilibration/sedimentation, mixed media filtration, carbon adsorption, and rotating filter-biofiltration. Each of these steps is described briefly and preliminary effluent data is tabulated. Cost of operating the system is about $50 per 1000 gallons or $750 a day. It is concluded that this system is effective for treating waste waters from tanker

cleaning that now go to municipal waste streams and may have applicability in a broad range of chemicals manufacturing industries. (Majtenyi-IPA)
W79-01583

TECHNICAL-ECONOMICAL SOLUTION TO THE PROBLEM OF EFFLUENTS IN AN INTEGRATED PAPER MILL (SOLUCION TECNICO-ECONOMICA DEL PROBLEMA DEL EFLUENTE EN UNA PLANT PAPELERA INTEGRADA EN OPERACION),
H. A. Del Roscio, and M. Davidovsky.
ATIPCA (Asociacion de Tecnicos de la Industria Papelera y Celulosica Argentina), Vol. 16, No. 4, p 45-56, 58-59, 1977. 1 appendix, 3 fig, 8 tab.

Descriptors: *Pulp and paper industry, *Waste water treatment, *Argentina, Water pollution treatment, Water pollution source, Wastes, Industrial wastes, Waste treatment, Pulp wastes, Effluents, Sedimentation, Aerated lagoons, Activated sludge, Foreign countries, South America, Costs, Capital costs, Operating costs, Groundwood mills, Printing paper, Writing paper, Corrugating medium(Fluting paper), Soda pulp mills, Bleached pulp mills, Chemical recovery.

A study is presented on effluent treatment possibilities at Celulosa Argentina SA. (Argentina), an integrated mill producing 130 tons/day of bleached and unbleached mechanical pulp, 130 tons/day of bleached and unbleached cold-soda pulp, and 300 tons/day of printing and writing papers and corrugating medium. Options considered included sedimentation and aeration lagooning of all effluents jointly (base alternative) and three alternatives associated with internal recovery of bark, mechanical pulp rejects, and fibers and fillers in papermaking, viz., separate secondary treatment of soda pulping effluents with the remainder of the effluents passing only through primary treatment (A), activated sludge treatment exclusively for the soda pulping effluents (B), and dilution of the soda pulping effluents coupled with primary treatment of the other effluents and mixing of the two streams (C). While alternatives A and B were immediately ruled out on the basis of space requirements of capital investiment needs, capital and operating costs were worked out in detail for the base alternative and for alternative C. Alternative C is shown to involve relatively low investment and operating costs and the latter are substantially offset by the internal recovery of materials. (Spckhard-IPC)
W79-01593

DISK FILTERS FOR EFFLUENT PURIFICATION (DISKOVYE FIL'TRY DLYA OCHISTKI STOCHNYKH VOD),
Ministerstvo Bumazhoni Promyshlennost (USSR).
A. Ya. Tipsev, V. P. Svitel'skii, and V. A. Kovba.
Bumazhnaya Promyshlennost, No. 2, p 26-28, February, 1978. 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Filters, Water reuse, Recycling, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Waste treatment, Filtration, Effluents, Foreign countries, Specifications, Operation and maintenance, Efficiencies, Water purification, Water pollution control, Soviet Union(USSR), White water(Paper machines).

Multidisk filters, used for fiber recovery at paper mills, can be operated with a fibrous layer to recover all fiber fractions, or without the fibrous layer to serve as fractionators. Such filters have been installed at many Soviet paper mills in recent years. The specifications of these filters are tabulated, and a description is given of the installation, operation, and efficiency of the filters at Segezh and Svetogorsk mills (Eimco filters), Zhidachev mill (Fampa FS filters), and the Klaipeda boad mill (Jones filters). All these filters perform well and give a fiver recoveryof up to 95-97% and filler recovery of up to 92-93%. The filters can be used for any fiber-containing effluent, but they are most efficient for recovering fibers in white water from the manufacture of papers of low filler content. In all mills equipped with the filters the recovered fibers are reused and the clarified white water is recycle. For this reason their use for joint purification of white water and other paper mill effluents is not recommended. (Stapinski-IPC)
W79-01594

POTENTIAL FOR AN IMPROVED RETURN ON INVESTMENT IN THE PRODUCTION OF WOOD FIBERBOARD USING THE WET PROCESS (MOZNOSTI ZVYSENIA EFEKTIVNOSTI VYROBY DREVOVLAKNITYCH DOSAK MOKRYM SPOSOBOM),
Research and Development Inst. of Wood and Timber, Bratislava (Czechoslovakia).
F. Mytny.
Drevo, Vol. 32, No. 12, p 369-370, December, 1977. 16 ref.

Descriptors: *Pulp wastes, *Fiberboard mills, *Water pollution control, Economic impact, Wastes, Industrial wastes, Water pollution source, Water pollution treatment, Water reuse, Recycling, Costs, Operating costs, Capital costs, Waste treatment, Effluents, Return(Monetary), Closed systems.

The wet process developed by Defibrator AB. (Sweden) for the production of fiberboard gives a product with good quality, but the effluents generated result in environmental damage if is discharged directly into a recipient stream. Either an effluent treatment plant is constructed and operated at rather high costs, or an attempt is made to separate the organic materials from the effluent and use them as fodder material. A third alternative includes closing of water circuits in the plant resulting in zero discharge. While the treatment plant construction and operation results in substantially reduces return on investment, the third alternative has very little economic impact. The second alternative did not reach commercialization, because organics could be separated only partially from the effluent. It is concluded that whenever environmetal protection is mandated by law, the closing of water circuits presents an economically more advantageous alternative compared to construction and operation of an effluent treatment plant. (Trubacek-IPC)
W79-01595

PROCESS AND APPARATUS FOR INTRODUCING GAS BUBBLES INTO A LIQUID (PROCEDE ET DISPOSITIF POUR INTRODUIRE DES BULLES GAZEUSES DANS UN LIQUIDE),
Compagine Electro-Mecanique, Paris, (France),
J. Sterlini.
French Patent No. 2,355,554. January 20, 1978. 7 p, 2 fig, 5 claims.

Descriptors: *Patents, *Flotation, *Waste water treatment, *Pulp waste, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Bubbles, Aeration, Gases, Air, Water.

A flotation process, of use, for example, in treating papermaking effluents is designed to form in a bath bubbles having a diameter of less than 100 micrometers without producing currents which would break up flocks or unstable particle agglomerates. Specifically, an emulsion ofair in water, formed in known manner as a jet within the flotation bath, is deflected with an associated jet of water over a curved path within the bath such that the bubbles migrate from the emulsion jet to the water jet, from where they ascend through the bath. (Speckhard-IPC)
W79-01596

DECOLORING OF WATER-SOLUBLE AZO DYES BY OZONE (IN JAPANESE),
Gifu Univ. (Japan).
M. Matsui, Y. Satoh, K. Shibata, and Y. Takase.
Journal of the Society of Fiber Science and Technology Japan (Sen-i Gakkaishi), Vol. 34, No. 4, p T181-T186, April, 1978. 10 fig, 12 ref, 3 tab. English summary.

Descriptors: *Dyes, *Ozone, *Decoloring, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Water pollution treatment, Organic compounds, Color, Degradation(Decomposition), Chemical degradation, Azo dyes.

The reaction of ozone with the water-soluble azo dye C.I. Acid Orange 12 is of a pseudo first-order. It involves mainly attack on the N=N bonds in mono-azo dyes and cleavage of the aromatic rings to yield carboxylic acids. The decomposition involves intermediates containing active oxygen atoms. The reaction is accelerated by dissociation of OH groups in the dye molecule and by self-decomposition of ozone. (Brown-IPC)
W79-01599

CHARACTERIZATION OF VARIOUS CONDENSATE STREAMS IN THE KRAFT PROCESS,
National Council of the Paper Industry for Air and Stream Improvement Inc., New York.
M. E. Franklin.
NCASI Stream Improvement Technical Bulletin, No. 310, 33 p, April, 1978. 1 appendix, 15 fig, 1 illus, 10 tab.

Descriptors: *Pulp wastes, *Condensates, *Kraft mills, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Evaporation, Biochemical oxygen demand, Alcohols, Evaporators, Waste treatment, Water pollution treatment, Water pollution control, Methanol, Black liquor.

This study carried out by the NCASI West Coast Regional Center showed that methanol contributes about 35% of the BOD present in kraft mill condensates from multiple-effect black liquor evaporators. The sequence in which weak liquor is introduced to evaporators was shown to affect the distribution of BOD in the condensate streams from individual evaporator effects. To concentrate the bulk of the BOD in the smallest volume of condensate, weak liquor feed to the last stream effect was found to be most effective. Introduction of weak liquor at a point further down the evaporation step distributes the same amount of BOD into a larger condensate volume. The study also confirmed that digester condensates and turpentine decanter underflow streams are logical candidates for internal process load reduction schemes such as reuse or selective treatment. (Swichtenberg-IPC)
W79-01601

ELIMINATION OF IMPURITIES CONTAINED IN KRAFT MILL CONDENSATES (BADANIA NAD USUWANIEM ZANIECZYSZCZEN WYSTEPUJACYCH W KONDENSATACH Z CELULOZOWNI SIARCZANOWYCH),
Instytut Celulozowo-Papierniczy, Lodz (Poland).
U. Lubienska.
Przeglad Papierniczy, Vol. 34, No. 3, p 88-91, March, 1978. 4 fig, 1 ref, 4 tab. English summary.

Descriptors: *Pulp wastes, *Condensates, *Waste water treatment, *Kraft mills, Pulp and paper industry, Steam, Waste treatment, Water pollution treatment, Water pollution sources, Water purification, Air, Wastes, Industrial wastes, Chemical oxygen demand, Sulfides, Sulfur, Methanol.

The possible utilization of condensates from digester relief and black liquor evaporators and the resulting reduction of freshwater demand have been discussed in an earlier report. This article deals with the content of impurities in the condensates and with the elimination of volatile impurities by air or steam stripping. Condensates from digester relief gases and from a multiple-effect evaporator were analyzed for their COD, methanol, dry solids, sulfur, and sulfides contents, and samples of these condensates were treated with air and steam in a Vigreux column connected to two condensers. Considerable differences were found in the concentrations of individual impurities at various production points. Thus, the condensates should be

collected and treated separately for maximum purification efficiency. For example, the concentration of methanol was high in digester relief condensates and accounted for up to 80% of their COD. When operated under optimum conditions (air volume 60 times that of condensate), the purification efficiency was 11% when condensates at 70C were treated with air, about 35% when the temperature was 100C, and about 70% when steam was used for treatment. (Stapinski-IPC)
W79-01602

SUBMERSIBLE PUMPS ARE PROVEN IN EFFLUENT SYSTEM AT NEWTON FALLS (NEW YORK),
Newton Falls Paper Mill Inc., NY.
L. Piiparinen.
Pulp and Paper, Vol. 52, No. 6, p 126-127, June, 1978. 1 fig, 2 illus.

Descriptors: *Pulp wastes, *Sludge, *Pumps, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Solid wastes, Flow rates, Waste paper, Coated paper, Printing paper, Activated sludge.

Four Flygt electric submersible pumps which are contained in a 8 x 20 x 13 ft deep wet well, are pumping sludge (50% biologically active) from the secondary clarifiers back to the two aeration basins at the deinked waste paper pulp and coated/uncoated printing paper mill of Newton Falls Paper Mill Inc. When the sludge flow from the clarifiers exceeds the requirements of the aeration tanks, sludge is pumped to one of the primary oxidation lagoons by two smaller Flygt pumps. Average flow of sludge into and out of the pumping station is 2,000 gal/min. (Swichtenberg-IPC)
W79-01603

'OXYPHOTOLYSIS' – PROCESS FOR EFFLUENT CONTAMINANTS,
R. H. Harwood.
Recycling and Waste Disposal, Vol. 2, No. 6/7, p 156-157, July/August, 1977. 2 fig, 1 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Ozone, *Ultraviolet radiation, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Oxidation, Chlorinated hydrocarbon pesticides, Kraft mills, Cyanides.

A new broad-spectrum effluent treatment process, originally developed as a treatment method for metal-complexed cyanide wastes from the electroplating and photographic processing industries, has recently been introduced to the European market. Due to the energy input from UV radiation, the available oxidation energy per molecule of ozone is increased by up to 35%. This is due to the enhancement of the reaction between ozone and water to form hydroxyl radicals, which have a higher oxidation potential (2.80 volts) than ozone (2.07 volts). Additionally a portion of the UV radiation can excite the contaminant species to render it more susceptible to oxidation. The process also destroys chlorinated organics and organic thiophosphorus pesticides such as malathion. The Oxyphotolysis process compares favorably with treatment using ozone alone in decoloring unbleached kraft mill effluent. Treatment of a kraft mill effluent stream of 1,000,000 gal/day would require an ozone dosage of 5,000 lb/day when using ozone alone; under Oxyphotolysis, the dosage would be only 1,350 lb/day. (Witt-IPC)
W79-01604

LIVESTOCK FARMING AND ENVIRONMENTAL PROTECTION, (IN GERMAN),
U. Riemann.
Landtechnik, Vol. 28, No. 5, p. 149-153, March, 1973. 9 fig.

Descriptors: *Livestock, *Waste treatment, *Economics, Aerobic conditions, Anaerobic conditions, Anaerobic conditions, *Farm wastes, *Germany.

The livestock industry is confronted more and more with problems of environmetal protection linked to costs threatening its competitiveness. The aims of manure treatment regarding odors, pathogens and volume reduction by clarification are considered. Agricultural use of manure appears to be the most economical method. For biological degradation of manure, two detchniques are presented. Anaerobic decompostion yields strong smelling decay products and depends mostly on outside temperatures. In aerobic decomposition few or no offensive smells are created because of the aerobic bacteria. Aerobic degradation is suitable for different types of manure, proceeds quickly and develops its own heat. The aerobic operations of oxidation ditches, oxidation silos, forced-air systems, and their possible improvement are discussed. Composting also involves aerobic biological degradation and is more desirable hygienically. However its marketability is limited by lack of effective cost defrayments. (Solid Waste Information Retrieval System).
W79-01605

MOBILE CENTRIFUGAL UNIT FOR USE IN DEWATERING PAPER SLUDGES (DIE FAHRBARE ZENTRIFUGENANLAGE BEIM EINSATZ ZUR ENTWAESSERUNG VON PAPIERSCHLAEMMEN),
VEB Komplette Chemieanlagen, Dresden (East Germany).
For primary bibliographic entry see Field 5E.
W79-01606

USE IN THE BRICK INDUSTRY OF HIGHLY DISCOLORED FIBERS RECOVERED FROM THE FINAL EFFLUENT CLARIFIER OF A PAPER MILL (VERWERTUNG VON STARK VERFAERBTEM FANGSTOFF AUS DER RESTABWASSERKLAERANLAGE EINER PAPIERFABRIK IN DER ZIEGELINDUSTRIE),
VEB Druck- und Spezialpapiere, Golzern (East Germany).
For primary bibliographic entry see Field 3E.
W79-01607

ADVENTURES IN DESIGNING FOR 1984 EFFLUENT REDUCTION,
Gulf States Paper Corp., Tuscaloosa, AL.
For primary bibliographic entry see Field 5G.
W79-01608

TREATMENT OF BLEACH PLANT EFFLUENTS BY COMBINED REVERSE OSMOSIS AND FREEZE CONCENTRATION PROCESS,
Institute of Paper Chemistry, Appleton, WI.
A. J. Wiley, L. E. Dambruch, P. E. Parker, and H. S. Dugal.
Presented at TAPPI Environmental Conference, Washington, DC., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 63-70. 5 fig, 9 ref, 10 tab.

Descriptors: *Bleaching wastes, *Waste water treatment, *Reverse osmosis, *Freeze concentration, Wastes, Industrial wastes, Pulp wastes, Sulfite liquors, Water pollution treatment, Water pollution sources, Osmosis, Membrane processes, Membranes, Pulp and paper industry, Water conservation, Water reuse, Recycling, Capital costs, Operating costs, Costs, Pilot plants, Waste treatment, Cellulose acetate, Sulfite pulp mills, Kraft mills.

Bleach plant effluents containing 0.5% solids are concentrated to 5% solids by reverse osmosis in pilot-plant studies conducted by the Institute of Paper Chemistry (Appleton, Wisconsin) at the calcium-base sulfite mill of Flambeau Paper Co. (Park Falls, Wisconsin) and at kraft mills of the Continental Group (Augusta, Georgia) and Chesapeake Corp. (West Point, Virginia). The first freeze concentration (F.C.) stage concentrates the effluent from 5 to 15% which in turn is concentrated to 25% by the second F.C. stage. Approximately 97-98% of the effluent can be recovered as high-quality water that could be recycled to the pulp mill. The Concentrate from the F.C. process, i.e., 2-3% of the effluent flow, contains 90-95% of the total solids and 100% of the total color. At current levels of water consumption in the bleach plant, operating costs are $20-30/ton of bleached pulp (about $2.50/1000 gal of effluent) and capital costs are about $30,000/daily ton of bleached pulp. Reducing water consumption from 10,000 to 5,000 gal/ton would reduce operating charges to the $12-15/ton range and reduce capital costs to about $16,000/daily ton of production. If cellulose acetate reverse osmosis membrane suppliers could double or triple the expected membrane life, operating costs would drop to a competitive level. The reverse osmosis/F.C. process can be readily piped to an existing system, and extensive renovation is not required. (Swichtenberg-IPC)
W79-01610

STUDIES OF MEMBRANE PROCESSES FOR PULP MILL POLLUTION CONTROL,
St. Regis Paper Co., Pensacola.
G. Maples, and E. W. Lang.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 71-82. 17 fig, 5 tab.

Descriptors: *Pulp wastes, Bleaching wastes, *Waste water treatment, *Membrane processes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Membranes, Color, Separation techniques, Reverse osmosis, Costs, Economics, Biochemical oxygen demand, Dissolved solids, Organic compounds, Carbon, Sodium compounds, Operation and maintenance, Pilot plants, Florida, Osmosis, Waste treatment, Computer programs, Cellulose acetate, Polysulfone, Ultrafiltration, Decoloring, Kraft mills.

Ultrafiltration and reverse osmosis processes using polysulfone and cellulose acetate membranes, respectively, were evaluated for their application in purifying effluent from a pulp mill screen room and for removal of color from caustic bleach plant effluent. The tests were done in a tubular-membrane pilot plant in Florida. Graphical and tabular data are presented to show the effects of operating pressure, velocity, and solids concentration on flux and rejection of contaminants, viz., color, total organic carbon, BOD, total dissolved solids, and sodium. A computer program was designed to predict the steady-state concentration of contaminants, optimum operating conditions, and costs for membrane systems. Examples are presented of how membranes might be used in a kraft mill and the resulting rejections of color and other contaminants in the mill effluent. Pilot-plant results indicate that in-plant color removal by membranes is competitive with the costs of external treatment methods. (Swichtenberg-IPC)
W79-01611

SUCCESSFUL MEAD (CORPORATION) PROGRAM TO REDUCE EFFLUENT VOLUME,
Mead Corp., Kingsport, TN.
R. W. Self, and K. C. Ayers.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 83-87. 1 ref, 2 tab.

Descriptors: *Pulp wastes, *Sludge, *Water pollution control, Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Tennessee, Biochemical oxygen, Suspended solids, Effluents, Pulp and paper industry, Recycling, Water reuse, White water(Paper machines), Soda pulp mills, Fine-paper mills.

Raw waste loads to the primary and secondary (aerated stabilization basin) effluent treatment facilities were reduced from an average 16,500,000 gal/day in 1975 to 12,300,000 gal/day in late 1977 by an in-plant program conducted at a bleached soda pulp and fine-paper mill in Kingsport, Tennessee. The BOD (lb/day) of the raw waste load decreased while the concentration increased slightly. The decrease in the lb/day of total suspended solids was significant while the concentration was

also decreased slightly. In-plant projects to reduce effluent volume included recycling the white water from the high-speed fine-paper machine to the freshwater treatment plant; the development of a cooling-water system; use of excess clarified white water for stock dilution at the pulper, high-density fiber storage tank, and brown stock decker; and air purging of coating color on on-machine coaters during paper grade changes. (Swichtenberg-IPC)
W79-01612

COMPONENTS OF A SUCCESSFUL IN-MILL CLOSE UP PROGRAM,
Consolidated Papers, Inc., Whiting, WI.
D. J. Czappa.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 89-99. 6 fig, 5 tab.

Descriptors: *Pulp and paper industry, *Water conservation, Water reuse, Water pollution control, Wastes, Industrial wastes, Water pollution sources, Wisconsin, Industrial water, Suspended solids, Biochemical oxygen demand, Pulp wastes, Activated sludge, Groundwood mills, Printing paper, White water(Paper machines).

In-mill close-up procedures implemented during the period from 1974 to 1977 at the Wisconsin River Division of Consolidated Papers, Inc. (Whiting, Wisconsin) were largely responsible for the success of the activated sludge effluent treatment plant. Suspended solids and 5-day BOD discharges amounted to 8.5 and 10 ppm or 10 and 20% of the allowed Best Practical Technology (BPT) discharge limits (July 1977), respectively. Water consumption at the groundwood pulp and lightweight coated printing paper mill was reduced from 4,100,000 to 2,900,000 gal/day. Modifications in the collection and reuse systems are described for heavy and clarified white water, press section water, vacuum pump seal water, hot water, and groundwood white water. (Swichtenberg-IPC)
W79-01613

SPILL CONTAINMENT AND EFFLUENT MANAGEMENT PROGRAM AT THE HOPEWELL MILL, CONTINENTAL FOREST INDUSTRIES, THE CONTINENTAL GROUP, INC.,
Sirrine (J. E.), Co., Raleigh, NC.
A. B. Browner, I. K. Core, and D. C. Muntz.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 101-108. 2 ref, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Municipal wastes, Waste treatment, Water pollution treatment, Water pollution sources, Virginia, Effluents, Pulp and paper industry, Spills, Kraft mills, Linerboard mills, Corrugating medium(Fluting paper), Semichemical pulp mills.

The semichemical corrugating medium and kraft linerboard mill of Continental Forest Industries decided to meet 1977 effluent treatment requirements by participating in a large regional treatment plant and interceptor system operated by the City of Hopewell, Virginia. Accidental spills of concentrated chemicals in the brown stock washer, evaporator, recovery furnace, and causticizing areas were identified as a potential threat to the regional plant. A spill containment and effluent management system was established within the mill to reduce the frequency and impact of spills. Major design considerations for the system are described. (Swichtenberg-IPC)
W79-01614

OPERATING EXPERIENCES AT LONGVIEW FIBRE COMPANY'S PURE OXYGEN ACTIVATED SLUDGE SYSTEM,
CH2M/Hill, Corvallis, OR. Industrial Processes Div.
G. Peterson, J. Klein, and D. Martinsen.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 139-147. 6 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Operation and maintenance, *Washington, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper mills, Sulfite liquors, Oxygen, Sludge, Sludge treatment, Dewatering, Biochemical oxygen demand, Suspended solids, Effluents, Spills, Condensates, Kraft mills, Sulfite pulp mills.

Highlights of a 10-year program to reduce the volume and pollutant levels of effluent at a kraft (bleached and unbleached) and neutral sulfite semichemical (NSSC) mill in Washington include in-mill projects (viz., conversion of brown stock washing lines from 3 to 4 stages, steam stripping of digester and evaporator foul condensates, and collection and containment of pulp mill liquor spills), startup of a UNOX activated sludge treatment plant, and the purchase of two belt presses for sludge dewatering. Operating characteristics and problems are discussed for both the UNOX process and sludge-dewatering presses. Average effluent discharge levels for 5-day BOD and total suspended solids are 5,700 and 23,200 lb/day, respectively. (Swichtenberg-IPC)
W79-01615

DESIGN AND OPERATION OF GREAT NORTHERN PAPER COMPANY'S SECONDARY TREATMENT FACILITIES AT EAST MILLINOCKET, MAINE,
Jordan (Edward C.) Co., Inc., Portland, ME.
A. J. Condren, and P. H. Welch.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 149-156. 4 fig, 6 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Maine, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution souces, Pulp and paper industry, Aerated lagoons, Biochemical oxygen demand, Suspended solids, Nutrients, Neutralization, Sludge treatment, Dewatering, Operation and maintenance, Effluents, Newsprint mills.

Startup of the secondary effluent treatment system (an aeration basin with a retention time of 31 hr) occurred on October 1, 1976 at Great Northern Paper Co.'s 1000-ton/day newsprint mill in East Millinocket, Maine. Upon obtaining proper operational parameter control, the system has yielded an effluent of a quality superior to the average allowable discharge, i.e., 7,700 lb 5-day BOD/day and 6,800 lb total suspended solids/day. Data are presented depicting the statistical reliability of the system for 5-day BOD and total suspended solids removal, the nutrient and neutralization requirements, the secondary solids generation, and the secondary sludge dewatering system performance. In addition, operational problems encountered and corrective actions taken are addressed. (Swichtenberg-IPC)
W79-01616

THE RELATIONSHIP OF BIOLOGICAL POPULATION TO ACTIVATED SLUDGE PLANT PERFORMANCE,
Westvaco Corp., Covington, VA.
C. T. Bell.
Presented at TAPPI Environmental Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings (TAPPI, Atlanta, Georgia 30338), p 171-187. 5 fig, 17 illus, 3 ref.

Descriptors: *Activated sludge, *Pulp wastes, *Waste water treatment, *Biological communities, Wastes, Industrial wastes, Water pollution treatment, Waste treatment, Pulp and paper industry, Water pollution sources, Temperature, Hydrogen ion cooncentration, Dissolved oxygen, Toxicity, Virginia, Performance, Treatment facilities, Aerated lagoons.

Laboratory studies showed that the acclimated biological population retained in an aeration by suspension cannot tolerate erratic changes in temperature, pH, dissolved oxygen level, and toxicity. A temperature over 103F had a significant influence on the bactericidal effects of cooking liquor and dispersed rosin sizing. Since 1970 the operating efficiency at the activated sludge treatment plant of Westvaco Corp. (Covington, Virginia) has been reliably predicted by microscopic examination of the aeration bay suspension. Instantaneous information can be obtained regarding the health status of the overall biological population, the characteristics of floc formation, and the content of nonbiologically degradable materials. (Swichtenberg-IPC)
W79-01619

AUSTRIAN NATIONAL REPORT ON NON-WASTE TECHNOLOGY,
For primary bibliographic entry see Field 3E.
W79-01621

HOW AND WHY WE CHOSE INTEGRAL RECYCLING (AT THE ISOREL FIBERBOARD PLANT, CASTLEJALOUX, FRANCE),
Isorel, Puteaux (France).
For primary bibliographic entry see Field 3E.
W79-01622

THE OUTLOOK FOR PROGRESS AND TECHNOLOGICAL METHODS IN A PAPER INDUSTRY CONFRONTED WITH ENVIRONMENTAL PROBLEMS,
Centre Technique de Papier, Grenoble (France).
P. Monzie.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 365-378. 1 fig, 1 tab.

Descriptors: *Pulp and paper industry, *Pollution abatement, *Technology, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Air pollution, Pulp wastes, Bleaching wastes, Water pollution control, Storage requirements, Treatment facilities, Logging wastes.

Points of origin of pollutants and wastes in pulp and paper production are reviewed, and problems involved in the utilization of slash and other forest residues are discussed. The prospects of new low-pollution pulping and bleaching processes are analyzed. By 1985 several new principles will be in operation at pulp mills, notably ecology-conscious utilization of al forest and agricultural residues; more compact pulp-manufacturing units with minimizied air pollution in the immediate mill vicinity; and dimensional reduction or elimination of large storage areas and waste-treatment facilities. Cooperative efforts required to reach this stage are specified. (Brown-IPC)
W79-01623

NON-WASTE PRODUCTION OF BLEACHED KRAFT PULP,
Toronto Univ. (Ontario).
For primary bibliographic entry see Field 3E.
W79-01624

REDUCTION OF THE WATER-POLLUTING DISCHARGES FROM A BLEACHED SULFATE PULP MILL (REDUCTION DE LA CHARGE DE POLLUTION DE L'EAU PROVENANT D'UNE USINE DE PATE AU SULFATE BLANCHIE),
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
P. Lieben.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 385-403. 3 fig, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Kraft mills, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Economics, Biochemical oxygen demand, Color, Bark, Bleaching wastes, Recycling, Ion ex-

change, Oxygen, Water pollution control, Foreign countries, France, Pulp washing, Black liquor, Bleaching, Condensates, Decoloring.

The French Environmental Protection Agency (OCDE, Direction de l'Environnement) has been supporting studies on external effluent treatments and related technologies aimed at water pollution abatement by bleached kraft mills. The economies of such measures are discussed, notably the costs of BOD and color reductions via dry barking, improved pulp washing, spent liquor evaporation, bleaching waste recycling, ion-exchange, oxygen bleaching, and condensate treatment. (Brown-IPC)
W79-01625

BIOLOGICAL METHOD FOR PURIFYING KRAFT PULP MILL CONDENSATES,
Enso-Gutzeit Osakeyhtio, Imatra (Finland).
I. Vettenranta.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 415-419. 4 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Biological treatment, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Waste treatment, Foreign countries, Filtration, Filters, Bark, Pulp and paper industry, Nutrients, Toxicity, Sulfur bacteria, Sulfur compounds, Effluents, Water pollution control, Softwood, Europe, Finland, Condensates, Kraft mills.

The Enso-Biox process of removing odorous and toxic sulfur compounds from kraft evaporator and digester condensates is outlined, including pilot-plant and full-scale biofilter studies at Uimaharji, Finland. The liquid and gas filters use a filtering medium of softwood bark treated with a nutrient mixture to support growth of the sulfur bacteria. After being purified in the liquid units, the condensates are clean and safe enough to be released into the water system. Because the air which is blown through the liquid units becomes contaminated in the process, it is purified in the gas filter unit before being released into the atmosphere. The biofilter is much cheaper to build and operate than a steam-stripping unit. (Brown-IPC)
W79-01626

TWO EXAMPLES OF LOW EMISSION TECHNOLOGIES IN THE PULP AND PAPER INDUSTRY,
Fraunhofer-Gesellschaft fuer Foerderung der Angewandten Forschung e. V., Karlsruhe (Germany, F. R.).
E. Jochem.
In: Non-Waste Technology and Production, Pergamon Press, 1978, p 469-479. 2 fig, 22 ref, 4 tab.

Descriptors: *Pulp and paper industry, *Water pollution control, Water pollution sources, Pulp wastes, Bleaching wastes, Wastes, Industrial wastes, Water conservation, Foreign countries, Europe, Corrosion, Slime, Productivity, Pine trees, Effluents, Chlorine, Closed systems, White water(Paper machines), Coated paper, Hydrogen peroxide, West Germany, Sulfite pulps, Spruce trees(Picea), Beech trees(Fagus).

An outline of the productivity, structure, and emissions of the West German pulp and paper industry is followed by descriptions of two typical low-pollution manufacturing methods which have been developed with active federal research support. One of these methods involves the substitution of hydrogen peroxide for chlorine in bleaching sulfite pulps; the other deals with the closed-circuit manufacture of coated papers. Hardwood sulfite pulps (e.g., rayon-grade beech dissolving pulp) have been bleached by P (peroxide)-D (chlorine dioxide)-H (hypochlorite), P-H-D, or P-H-D-H sequences in which chlorine was completely replaced by peroxide; for softwood (spruce or pine) paper pulps a chorine prebleach was required, but the dosage could be reduced from the usual 5-7% to 102%. High-quality fine papers have been produced on paper machines with nearly completely closed white water circulation without significant effect on product specifications, but some operating problems (corrosion, slime, etc.) require further research ad development work. It is estimated that 20% of all paper can be produced without any waste water discharge, and another 70% with considerable water conservation, for a total 60-70% reduction of water consumption. (Brown-IPC)
W79-01627

LIQUID MANURE AND ENVIRONMENT PROTECTION, (IN GERMAN),
For primary bibliographic entry see Field 5E.
W79-01628

FIELDS OF USE AND APPLICATION OF MANURE AND MANURE DISPOSAL, (IN GERMAN),
For primary bibliographic entry see Field 5E.
W79-01633

UTILIZATION AND DISPOSAL OF LIQUID MANURE AT SMALL AVAILABLE SPACE, (IN GERMAN),
For primary bibliographic entry see Field 5E.
W79-01640

PROCESS AND APPARATUS TO TREAT PUTREFACTIVE WASTE FROM RAW FISH AND MEAT.
Belgian Patent BE-842-053. Issued September 16, 1976. Derwent Belgian Patents Report, K(41):03, November 17, 1976.

Descriptors: *Dewatering, *Waste water treatment, *Waste disposal, Energy conversion, Heat treatment, Fertilizer, *Meat processing wastes.

A process and apparatus to treat putrefactive waste from raw fish and meat was patented. It can treat such material rapidly without causing odor. The waste from domestic or industrial kitchens moves between grinding rollers and into a chute, then to an endless screw type grinder. Solids are separated and move through dehydrating rollers to an ultraviolet sterilizing chamber; they are dried by hot air in a perforated drum on their way to a receptacle. The separated liquid flows to a stirrer where a deodorizing liquid is added to the mixture, goes to a header tank, and then to a concentrating tank where the pressure is reduced. Oil and water are separated by centrifugation and flow to separate reservoirs. The by-products may be used as fertilizer or animal feed. The oil recovered can be burned as fuel; the water can be further purified. (EPA-Corvallis)
W79-01647

KANAWHA RIVER INVESTIGATION OF WATER QUALITY AND WATER POLLUTION CONTROL PRACTICES. VOLUME II: REPORTS OF INDUSTRIAL INVESTIGATIONS ON SEVEN INDUSTRIES.
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 499, Price codes: A11 in paper copy, A01 in microfiche. July 1973. 226 p, 31 fig, 34 tab.

Descriptors: *Water pollution, *Industrial wastes, *Waste water treatment, *Kanawha River, West Virginia, Surveys, Effluents, Industrial plants, Pollutants, Waste disposal, Water quality control, Monitoring, Water usage, Sampling, Evaluation, On-site tests, On-site investigations, Rivers, Water pollution treatment.

The industrial treatment of waste waters discharged into the Kanawha River in West Virginia was investigated to determine if treatment is adequate and, if not, to ascertain what waste reductions are necessary to attain water quality standards. Studies were carried out by four industrial firms on seven industrial plants in the area. Each of the four, E. I. du Pont de Nemours, Union Carbide, FMC, and Monsanto, reported separately on their investigations. Each report describes plants and the wastes produced, existing waste treatment facilities, and waste water disposal. Specific data are supplied for each plant surveyed, including such information as discharges, sources, and flows of particular chemical pollutants, levels of biochemical oxygen demand loading, and comparisons of field studies carried out by Environmental Protection Agency laboratories with those done by the industrial laboratories. Also discussed are monitoring programs, spill potential, and future plans of the individual plants investigated. (Majtenyi-IPA)
W79-01654

ORGANIC IMPURITIES FROM INDUSTRIAL WASTE WATER REMOVAL - BY TREATMENT WITH ACTIVATED CARBON CONTAINING MANGANESE OXIDE(S) USEFUL IN CHEMICAL INDUSTRY.
Soviet Patent SU-494-929. Issued November 29, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 34, p 2, October, 1978.

Descriptors: *Patents, *Activated carbon, *Manganese, *Adsorption, *Industrial wastes, *Dyes, Heat treatment, Chemical wastes, Temperature, Ammonium compounds, Waste water treatment, Organic compounds, Chemical oxygen demand.

A patent has been granted for an adsorption process to treat aniline-bearing wastes from a dye works, wastes containing surfactants and dyes from an alkali plant, or municipal sewage having a high COD. Granular activated carbon containing manganese oxides in an amount of 3-6% by weight is employed as the adsorbent. In an example cited, the adsorbent was prepared by impregnating activated carbon with a 3-10% aqueous solution of manganese nitrate or sulfate, followed by air drying at 150-170C. The manganese-bearing carbon was then treated with a 6-12% ammonia solution, air heated to 250-280C, and rinsed until the Mn content of the washwater was less than 1 mg/liter. Columns of activated carbon bearing 3.5, 3.0, and 5.0% Mn were employed with the alkali, aniline, and sewage wastes, respectively; corresponding treatment efficiencies of 95.2-98.5%, 96.0-99.0%, and 92.5-96.0% were obtained. Regeneration of the adsorbent by passing a stream of air through the column at 250-280C instead of the 500-800C generally used substantially reduced losses during regeneration from the 5-10% normally obtained to 1.1-2.9%. (Schulz-FIRL)
W79-01703

METHOD FOR ADENOSINE 5'-TRIPHOSPHATE MEASUREMENT ON COKE WASTE ACTIVATED SLUDGE,
Alabama Univ. in Birmingham, Dept. of Biology.
J. Russell, and J. J. Gauthier.
Applied and Environmental Microbiology, Vol 35, No 2, p 450-452, Feb., 1978. 2 tab, 18 ref. OWRT A-060-ALA(1).

Descriptors: *Coke waste activated sludge, Inhibitors, *Activated sludge, *Adenosine 5'-triphosphate, Measurement, Waste water treatment, Waste identification, Sodium dodecyl sulfate.

Measurement of adenosine 5'-triphosphate (ATP) in coke waste activated sludge can provide a simple method for estimating the levels of viable microbes in the sludge. However, the presence of inhibitors such as phenol in the sludge interferes when the luciferin-luciferase method is used to measure ATP. These inhibiting substances can be removed from the sludge before extraction of ATP by washing the cells with dilute sodium dodecyl sulfate.
W79-01723

SOME FACTORS AFFECTING DENITRIFICATION IN SOILS IRRIGATED WITH WASTEWATER,
Ohio State Univ., Columbus. Dept. of Agronomy.
For primary bibliographic entry see Field 5E.
W79-01729

Group 5D—Waste Treatment Processes

REMOVAL OF COMPONENTS FROM WASTEWATERS GENERATED IN TEXTILE FINISHING PROCESSES. PART II. SEPARATION OF CONTENTS FROM WASTEWATERS. SIZE (ELIMINIERUNGEN VON INHALTSSTOFFEN IN ABWASSERN DER TEXTILVEREDLUNG-TEIL II TRENNUNG CON ABWASSER-INHALTSSTOFFEN, SCHLICHTE,
K. Fischer.
Melliand Textilberichte, Vol. 59, No. 7, p 582-588, 1978. 13 fig.

Descriptors: *Textiles, *Chemical precipitation, *Reverse osmosis, *Polymers, *Surfactants, Membrane processes, Solubility, Organic wastes, Separation techniques, Biological treatment, Waste water treatment, Industrial wastes.

General problems in eliminating organic components from waste waters generated in textile finishing processes are discussed with special regard to precipitation and reverse osmosis. The precipitation of water-soluble polymers decreases with an increase in polymer concentration in the influent. Although nonionic surfactants cannot be effectively precipitated by means of organic and inorganic agents, surfactant-bearing solutions can be concentrated by reverse osmosis with cellulose acetate membranes. Starch-based sizings can be eliminated directly by biological treatment; sizings based on poly(vinyl alcohol) or carboxymethyl-cellulose may require additional conditioning before biodegradation. Starches, polyacrylates, poly(vinyl alcohol), and carboxymethylcellulose can also be precipitated with iron salts. (Takacs-FIRL)
W79-01757

STUDIES OF FLOCCULATION AND SEDIMENTATION TREATMENT OF PULP MILL EFFLUENT (PART 3) - RECOVERY AND REUSE OF ALUM SLUDGE (PARUPU HAISUI GYOSHU SHORIHO NO KENKYU (DAI-SANPO) - RYUSAN ARUMINYUMU SHORI SURAJI NO KUROZU KA SHORI),
For primary bibliographic entry see Field 5E.
W79-01758

OPTIMIZE THE EFFLUENT SYSTEM. PART 6: BIOCHEMISTRY OF ACTIVATED SLUDGE PROCESS.
Standard Oil Co. (Indiana), Chicago, IL.
J. F. Grutsch, and R. C. Mallatt.
Hydrocarbon Processing, Vol. 55, No. 8, p 137-142, August, 1976. 7 fig, 2 tab, 15 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Enzymes, *Biochemistry, *Bacteria, Chemical reactions, Microorganisms, Biological treatment, Solid waste, Liquid wastes, Solubility, Suspended solids, Colloid, Performance, Optimization, *Biochemistry.

The biochemistry of activated sludge treatment is discussed, with particular emphasis on the role of enzyme reactions and the transport of substrate through the bacterial cell wall and membrane. Exoenzymes are needed to hydrolyze colloidal and suspended solids into smaller soluble molecules that can pass through cell membranes for food. However, these enzymes may be dispersed and lost in the effluent or destroyed by exposure to changes in pH, salinity, and other conditions. Endoenzymes on the other hand are at least partially protected from these environmental changes by the bacterial cell wall and membrane; thus, using the biological process for the removal of only soluble contaminants is consistent with obtaining a stable system. Moreover, activated sludge units that utlize only soluble contaminants can be operated at very high sludge ages, thus permitting much higher biological cell inventories which in turn increases stability, capacity, and purification while minimizing the generation of excess biological cells. (See also W77-00766; W76-12667) (Kreager-FIRL)
W79-01759

HOW TO CONDUCT A WASTEWATER SURVEY: PART II - DEVELOPING WASTE STREAM PROFILES,
Burns and Roe Industrial Services Corp., Paramus, NJ.
For primary bibliographic entry see Field 5G.
W79-01760

BIODEGRADATION OF PHENOLIC WASTE LIQUORS IN STIRRED-TANK, PACKED-BED, AND FLUIDIZED-BED BIOREACTORS,
Oak Ridge National Lab., TN.
D. W. Holladay, C. W. Hancher, C. D. Scott, and D. D. Chilcote.
Journal Water Pollution Control Federation, Vol. 50, No. 11, p 2573-2589, November, 1978. 6 fig, 8 tab, 19 ref.

Descriptors: *Biodegradation, *Phenols, *Chemical wastes, *Biological treatment, *Industrial wastes, *Packed beds, Filters, Pilot plants, Microorganisms, Coals, Waste water treatment.

A continuously-stirred tank bioreactor (CTSBR), a three-phase (air, liquid, and bacteria-coated media) packed-bed bioreactor (PBBR), and a three-phase, fluidized bed bioreactor (FBBR) were tested for the biodegradation of phenolic waste liquors from coal processing. The phenol degradation rates achieved by the three reactors were quantified according to a formula incorporating the volumetric flow rate, the feed and effluent phenol concentrations, and the effective reactor volume. The maximum phenol degradation rates achieved at a feed concentration of 500 mg phenol/liter and 0.99 conversion were 1.0, 4.7, and 8.5 g phenol/day/liter of bioreactor volume for the CSTBR, PBBR, and FBBR, respectively. Normal effluent phenol concentrations at maximum conversion were 0.25-1.00, 0.25-1.00, and 0.01-0.50 mg/liter for CSTBR, PBBR, and FBBR operation, respectively. Preliminary results indicated that the FBBR would also be effective in oxidizing thiocyanates at lower flow rates than the maximum rates attainable for effective phenol degradation. (Schulz-FIRL)
W79-01762

REFINERY CYANIDES: A REGULATORY DILEMMA,
Air Products and Chemicals, Inc., Allentown, PA.
R. G. Kunz, J. P. Casey, and J. E. Huff.
Hydrocarbon Processing, Vol 57, No 10, Section 1, p 98-106, October, 1978. 4 fig, 2 tab, 101 ref.

Descriptors: *Nitrogen compounds, *Oil industry, *Analytical techniques, *Industrial wastes, Toxicity, Oil wastes, Chemical wastes, Iron compounds, Corrosion, Waste water treatment.

Cyanides in petroleum refinery effluent can be in free, simple, or complexed forms which vary in toxicity to aquatic life. Simple cyanides may form complexes with metals in petroleum waste water and induce corrosion in coolers, condenser shells, and strippers; polysulfides have been used to inhibit corrosion in some catalytic cracking systems. Research on analytical techniques for cyanides in refinery effluents has focused on devising methods to differentiate between simple and complexed cyanides and to eliminate interference by thiocyanate with cyanide concentrations below 1 mg/liter; the modified Roberts/Jackson method to measure small amounts of cyanide in the presence of ferrocyanide is described. Methods which have been used to remove cyanides from refinery effluents include chemical oxidation, biological treatment, adsorption and catalytic oxidation, and precipitation. (Schultz-FIRL)
W79-01763

STATE OF THE ART REPORT ON PESTICIDE DISPOSAL RESEARCH,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5E.
W79-01764

THE REMOVAL OF ARSENIC(V) FROM ACIDIC SOLUTIONS,
Waste Research Univ, Oxon (England). Harwell Lab.
C. J. Jones, B. C. Hudson, and P. J. McGugan.
Journal of Hazardous Materials, Vol. 2, No. 4, p 333-345, 1977/1978. 9 fig, 4 tab, 2 ref.

Descriptors: *Arsenic, *Metals, *Chemical precipitation, *Lime, *Iron compounds, Magnesium hydroxide, Dolomite, Leaching, Heavy metals, Industrial wastes, Sludge disposal, Waste water treatment.

Treatment with iron salts and alkaline earth metal compounds has been used for effluents from electrolytic copper reclamation. Experiments to establish the treatment efficiency for these effluents employed model solutions of As2O5 in 1.5% H_2SO_4 solutions which were treated with various combinations of ferric sulfate, ferrous sulfate, lime, magnesium hydroxide, and dolomite. Following treatment, the solids were removed by centrifugation and the supernatant was analyzed for arsenic(V). Triangular diagrams outlined composition ranges for the treated liquors of 0.2-1.2% arsenic, 1.0-4.0% iron, and 3.0-6.5% alkaline earth metal. Treatment with ferrous sulfate plus lime was the most effective configuration, achieving 99.9% arsenic removal and residual concentrations of about 5 ppm. Treatment with ferric sulfate plus lime was less effective than with ferric sulfate-lime, and magnesium hydroxide. The optimum particle size range for lime in ferrous-lime treatment was determined to be 50-100 microns. Ferric sulfate plus dolomite was fairly ineffective in removing arsenic from the solutions studied. Leaching tests on arsenic-bearing sludge from the ferrous sulfate-lime process in sand, clay, and chalk dispersions demonstrated that arsenic levels in leachate would be less than 1.0 ppm and generally less than 0.05 ppm; this suggested that the arsenic-bearing sludges would be suitable for land disposal without posing a hazard to drinking water supplies. (Schulz-FIRL)
W79-01765

RECOVERING SYSTEM FOR CHROME-PLATING WASTEWATER CONTAINING CHROMIC ACID (KUROMU MEKKI HAISUI NO SHORI SHISUTEMU),
T. Uratsuji, and H. Yoshida.
Mitsubishi Juko Giho (Mitsubishi Heavy Metal Industries Technical Review), Voi. 15, No. 4, p 508-511, 1978. 4 fig, 4 tab, 2 ref.

Descriptors: *Chromium, *Metals, *Recycling, *Ion exchange, *Chemical precipitation, Acid wastes, Evaporation, Electrolysis, Industrial wastes, Waste water treatment.

A chromic acid recovery system for electroplating lines has been designed to employ three treatment processes with the selection dependent upon the chromate concentration and source of the waste solution. Electrolysis is used to purify waste solutions from chrome plating and peeling baths which contain 150-300 g/liter chromate. Vacuum condensation is used to concentrate rinse waters initially containing 50-200 ppm chromate; more dilute rinse waters containing only 5-50 ppm chromate are treated in an ion exchange column. The process is reported to be capable of recovering 63% of the chromic acid and 90% of rinse waters. Chromic acid solutions which can not be recovered are treated by reaction with ferrite before discharge. (Schulz-FIRL)
W79-01767

USE OF CONTINUOUS ION EXCHANGE FOR REMOVAL OF ENVIRONMENTAL CONTAMINANTS FROM WASTE STREAMS,
Bradford Univ., (England), School of Chemical Engineering.
M. J. Slater, B. H. Lucas, and G. M. Ritcey.
CIM Bulletin, Vol. 71, No. 796, p 117-123, August 1978. 8 fig, 6 tab, 11 ref, 1 append.

Descriptors: *Ion exchange, *Acid mine water, *Resins, *Separation techniques, *Heavy metals, Copper, Iron, Nickel, Sodium, Cobalt, Mine drainage, Acidity, Voids, Mass transfer, Mine wastes, Waste water treatment, Industrial wastes.

Static and continuous flow tests in a tapered, fluidized-bed ion-exchange column defined the optimum conditions for removal of heavy metals, especially copper, from acid mine water. The pilot plant included: a 96-inch column with a 6-inch square base and an 8-inch square flared top, fed with a strong acid resin, Amberlite 200 C in the sodium form; a 60-inch regeneration column, fed with a saturated NaCl solution; and a wash column. A synthetic sulfate mine water used in the tests contained 56 ppm Cu, 3.5 ppm Ni, 0.3 ppm Co, 1 ppm Fe, and 20 ppm Ca, at 4.0. Static tests were performed to obtain breakthrough curves, indicating that a copper loading of 0.030 g of Cu/m of wet settled resin was accommodated. Voidages were varied over 0.50-0.80 and expanded bed heights of 134-215 cm were tested. A voidage of 0.7 and a bed height of roughly 214 cm were selected for continuous flow tests at a liquid velocity of 1.22 cm/sec; NaCl loss from the 24-inch wash column was reduced by doubling the column length. The fluidized-bed extraction reduced effluent metal concentrations to <0.02 ppm Cu, <0.03 ppm Ni, <0.04 ppm Co, <0.03 ppm Fe, and <0.04 ppm Ca. Three column configurations were developed for treating 650 Imperial gal/min of mine water with a waste strength similar to that of the synthetic solution. (Lisk-FIRL)
W79-01768

REMOVAL OF COLOR FROM CARBONATE PULPING EFFLUENT THE CALCIUM-MAGNESIUM COAGULATION PROCESS,
Institute of Paper Chemistry, Appleton, WI.
S. G. Lathia, and T. W. Joyce.
Tappi, Vol. 61, No. 10, p 67-70, October, 1978. 4 fig, 4 tab, 11 ref.

Descriptors: *Pulp wastes, *Color, *Coagulation, *Chemical precipitation, *Industrial wastes, Lime, Magnesium, Hydrogen ion concentration, Separation techniques, Sludge disposal, Chemical reactions, Waste water treatment.

The increased use of sulfurless 'carbonte' pulping by many neutral sulfite semichemical (NSSC) mills provided the impetus for experiments to remove at least 90% of the color from a whole-mill effluent by coagulation with minimum quantities of calcium and magnesium salts. Jar tests demonstrated that 350 ppm dosages of calcium or magnesium ion at a pH of 12 would provide the desired degree of color removal. A regression equation was developed from the experimental data to predict the percent color removal at any given salt dosage and pH. Comparison of infrared spectra for NSSC and carbonate effluents indicated that the NSSC effluent contained significant amounts of carbonate, sulfate, Tiosulfate, lignin, lignosulfate, and carboxylic groups; the carbonate effluent contained only significant amounts of carbonte and was predominated by aromatic nuclei rather than carboxylic groups. Chemical precipitation was cited as the major mechanism of color removal by the lime-magnesium coagulation process. The process was apparently reversible as the resulting sludge would redissolve and color return to the effluent when the pH was lowered to about 7.6; this phenomenon led to a recommendation that the raw sludge be incinerated before disposal. (Schulz-FIRL)
W79-01769

TOXICITY REMOVED BY FOAM SEPARATION,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
K. S. Ng, L. A. Gutierrez, and J. C. Mueller.
Industrial Wastes, Vol. 24, No. 5, p 36-38, 40-41, 1978. 5 fig, 3 tab, 12 ref.

Descriptors: *Aeration, Toxicity, *Foam separation, *Pulp wastes, *Pulp and paper industry, Bleaching wastes, Pilot plants, Chemical wastes, Separation techniques, Turbines, Bubbles, Industrial wastes, Waste water treatment.

Pilot studies at two bleached draft mills in Canada evaluated foam separation as a means of reducing the toxicity of kraft mill effluents. The 100,000 gpd pilot plant employed jet aerators for foam generation, turbines for foam breaking, and a pH control system. Jet aerator performance was evaluated in terms of the effect of jet air load, influent characteristics, retention time, ease of installation and operation, dependibility, and bubble consistency. The turbine foam braker was evaluated in terms of capacity, reliability, and power consumption. Influents from the two kraft mills had toxicity ranges of 6-23 and 1.1-8 hrs (median survival time of fish). Critical gas interfacial areas for detoxification of the two effluents were 5.3-7.8 and 40 sq m/liter at success rates of 89 and 84%, respectively. The jet aerator produced mean bubble sizes of .015 and 1.2 mm at air loads of 0.03 and 0.6 cu m/min, respectively. The three-blade vaned disc turbine was capable of collpsing 1.4 cu m foam/min. (Schulz-FIRL)
W79-01770

REMOVING TOXICITY IN AN AERATED STABILIZATION BASIN,
British Columbia Forest Products LTD., Mackenzie.
K. Chandrasekaran, R. Reis, G. Tanner, and H. Rogers.
Pulp & Paper Canada, Vol. 79, No. 10, p 65-68, 70, 72, October, 1978. 4 fig, 3 tab, 18 ref.

Descriptors: Toxicity, *Aeration, *Oxidation lagoons, *Biological treatment, *Pulp wastes, Pulp and paper industry, Biochemical oxygen demand, Resins, Industrial wastes, Lethal limit, Bioassay, Waste water treatment.

the British Columbia Forest Products Ltd. mill in Mackenzie combines maximum in-plant containment with biological treatment in a 4.7-day aeration lagoon which has achieved average BOD reductions of 88%. A study was conducted over a 28-day period to monotor the toxicity of clarifier inlet, outlet, and aeration lagoon outlet waste water in terms of median fish mortality (LC50), a tocicity emission rate (TER), and toxicity emission index (TEI). The aerated stabilization basin achieved average removal rates of 68% BOD, 90% toxicity, and 96% total resin acids over the study period. The 96hr-LC50 values were 100% or greater for 24 tests. More toxic levels of 77 and 98% for the remaining two samples were attributed to black liquor losses. Resin acids detected at the clarifier outlet included 13.9% pimaric, 20.8% isopimaric, and 65.2% abietic plus dehydroabietic; dehydroabietic acid dominated the stabilization lagoon effluent. The resin content of foam from the lagoon was highly variable. The highest concentrations of resin acids in foam and sludge were in samples collected at a quiescent zone near the lagoon outfall. Unbleached whitewater was the largest contributor to the total untreated toxicity at the Mackenzie mill. (Schulz-FIRL)
W79-01772

STATUS OF THE CLOSED-CYCLE CONCEPT KRAFT MILL AT GREAT LAKES PAPER CO.,
Great Lakes Paper Co., Ltd., Thunder Bay (Ontario).
For primary bibliographic entry see Field 3E.
W79-01773

COLOR REMOVAL FROM TEXTILE DYE WASTE USING MAGNESIUM CARBONATE,
Auburn Univ., AL. Dept. of Civil Engineering.
J. F. Judkins, and J. S. Hornsby.
Journal Water Pollution Control Federation, Vol. 50, No. 11, p 2446-2456, November, 1978. 8 fig, 2 tab, 5 ref.

Descriptors: *Textiles, Coagulation, *Dyes, *Magnesium carbonate, *Industrial wastes, *Color, Lime, Chemical wastes, Separation techniques, Recycling, Magnesium compounds, Waste water treatment, Effluents, Hydrogen ion concentration.

Jar tests were performed to evaluate coagulation with magnesium carbonate and/or lime for the treatment of textile waste. The experiments utilized seven different dye wastes, including four prepared with synthetic dyestuffs (vatblue 6, vat yellow 22, Levco sulfur blue 7, and disperse blue 7, and disperse blue 3) and three collected from the washboxes on the dye range at a textile mill (vat waste, sulfur dye waste, and a mixture of sulfur and idspersed waste). The magnesium carbonate/lime treatment was vry effective for decoloration of vat wastes and less effective with dispersed dyes; treatment with 50 mg/liter MgCO3 and 330 mg/liter Ca(OH)2 removed 91, 100, and 54% of the color from the synthetic vat, sulfur, and dispersed dye wastes, respectiely. Magnesium recoveries of 87-97% were achieved in studies evaluating the feasibility of recovery following coagulation of synthetic blue vat dye wastes. The high natural pH of the actual textile mill vat wastes (10.0-12.0) made them especially amenable to the combined magnesium carbonate/lime treatment. The combined treatment was more effective than treatment with either lime or magnesium carbonate for all three actual waste streams, although high dosages were required for the sulfur-dispersed waste. (Schulz-FIRL)
W79-01776

RATIONALIZATION AND ENVIRONMENTAL PROBLEMS OF BEAMHOUSE OPERATIONS,
E. F. Miller.
The Leather Manufacturer, Vol. 95, No. 10, p 12, 15-18, 30-33, 20-28, October, 1978. 8 fig, 53 ref.

Descriptors: *Tannery wastes, *Chromium, *Recycling, *Water consumption(Except consumptive use), *Industrial water, Water reuse, Pollutant identification, Proteins, Heavy metals, Effluents, Industrial wastes, Waste water treatment.

Beamhouse operations are discussed with respect to the minimum quantity of water required for leather production and methods of reducing effluent pollutants without impairing the leather quality. Presoaking, soaking/liming, deliming/bating, washing, pickling/tannage, and cleaning are reported to require 2-3, 1-2, 1-2, 1-2, 0.5-1, and 1-2 liters water/kg salted hide or a total of 8.5-15 liters/kg raw hide. Of the tanning waste streams, liming liquor is cited as the strongest source of pollution from the tannery because of its high levels of suspended solids and protein. Pilot studies in several countries have demonstrated that liming liquors may be reused 15-20 times. Protein may be removed from liming liquor by lowering the pH to the isoelectric point of the protein components or by precipitation in an alkaline medium. Methods to improve the quality of effluents from pickling and tannage include precipitation of the chrome tanning agent in the residual liquors, direct reuse, process optimization, and partial replacement of the chrome tanning agent by other materials. (Schulz-FIRL)
W79-01778

LEATHER TANNING INDUSTRY-SLUDGE PROBLEMS AHEAD,
For primary bibliographic entry see Field 5E.
W79-01779

THE EVOLUTION OF TANNERY EFFLUENT TREATMENT--GUIDELINES FOR FURTHER INVESTIGATIONS,
S. G. Shuttleworth.
Journal of the Society of Leather Technologists and Chemists, Vol. 62, No. 4, p 87-94, July-August, 1978. 2 fig, 4 tab, 87 ref.

Descriptors: *Tannery wastes, *Biological treatment, *Activated sludge, *Oxidation, Sulfur compounds, Industrial wastes, Pilot plants, Aeration, Return flow, Coagulation, Sludge treatment, Sludge disposal, Trickling filters, Waste water treatment.

Pilot studies on and the development of methods to treat tannery wastes are reviewed extensively. Lagoons have been used to reduce the BOD of tannery effluent as well as to store treated effluent during periods of low river flow or inclement weather. Spray irrigation of grasslands has been practiced successfully for 60 yrs in South Africa. The increased incidence of municipalities having to treat combined domestic/industrial waste streams

has given rise to the development of tannery waste pretreatment and disposal standards. Flue gas and surface aeration have been employed to control the pH of beamhouse liquors. Manganese-catalyzed oxidation, iron salt additions, activated sludge, and acid/alkali processes have been used for sulfide liquors; low sulfide, enzyme, and other sulfide-free processes have been tested as pollution-reducing alternatives to conventional high sulfide unhairing. Equipment modifications have allowed reductions in the quantity of lime required in tanning. Trickling filters, high-rate biofilters, oxidation ditch systems, extended aeration, and the activated sludge process have been employed to biologically treat tannery wastes; physicochemical treatment has generally incorporated additions of iron salts or alum. Pilot studies at a fellmongery and a tannery in South Africa have tested the activated sludge process for the treatment of segregated beamhouse waste and tan liquors. Recommendations are made for further studies to optimize the activated sludge process for tannery wastes and for sludge handling practices. (Schulz-FIRL)
W79-01780

REPORT OF WASTE SOURCE INVENTORY AND EVALUATION, DADE COUNTY, FLORIDA.
Environmental Protection Agency, Athens, GA. Southeast Water Lab.
For primary bibliographic entry see Field 5G.
W79-01834

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
May 22, 1972, Vol. II, 551 p.

Descriptors: *Effluents, *Water quality, *Wastewater treatment, *Public health, *Florida, Public rights, Sewage treatment, Municipal wastes, *West Palm Beach(FL), *Palm Beach County(FL), *Environmental impacts, Public attitudes, Public values, Public participation, EIS review process, Sewage treatment plants.

This is an extensive transcript of a public hearing conducted May 22, 1972 concerning proposed sewage treatment plants in West Palm Beach, Florida. It is the second of two volumes of evidence presented at the public hearing to the regional EPA and includes comments of many people concerned with the environmental consequences of building wastewater treatment plants. Briefly, the town of West Palm Beach started construction on a modern secondary treatment plant which discharged through an outfall into the influence of the Gulf Stream. Construction was halted in 1971 until a final EIS statement was prepared. This volume is useful in helping the regional EPA judge the merits of the wastewater treatment project and the possibilities of providing alternate plans for treating and disposing of municipal wastes. The text provides testimony from expert witnesses on the merits of secondary and tertiary wastewater treatment processes and the subsequent disposal problem of effluents. The public hearing also covering the environmental impact of the proposed project, including the air, land and noise impacts on the recreational areas and historical sites nearby. Public attitudes about the project were recorded. (Coan-NC)
W79-01839

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
May 22, 1972, Vol. 1.

Descriptors: *Waste water treatment, *Sewage disposal, Primary treatment, Secondary treatment, Tertiary treatment, Sewage treatment, Municipal wastes, *Water quality, *Water pollution control, *Wastewater management, Public water supply, Public health, Biochemical oxygen demand, Public rights, Florida, *Palm Beach County(FL), *Environmental impacts, EIS review process, *West Palm Beach(FL), *Public participation, Public values.

This report is a compilation of documents presented at a public hearing on May 22, 1972 at the County Commission Chambers in the Palm Beach County Courthouse, West Palm Beach, Florida. All documents were presented to the regional EPA concerning the environmental impacts of the proposed sewage disposal plants in West Palm Beach. These facilities originally included a proposal for tertiary treatment by the use of polishing ponds and discharge into the ship's channel of Lake Worth and an alternate plan to have a modern seconary treatment plant with discharge through an outfall into the influence of the Gulf Stream. The alternate plan was approved by the necessary agencies, financial arrangements were made, and some construction was begun. In 1971, all construction was stopped until a final EIS was produced. This report aids EPA's EIS reviews process by presenting all sides in the controversy surrounding the construction of the treatment facilities. Governmental agencies submitted reports, consulting firms conducted studies and submitted their findings, area specialists were contacted and their advice is recorded. The document lists testimony by area of public interest groups and city and county officials, newspaper stories covering the debates, attorney's briefs on the relevant legal issues, and all other relevant papers submitted to the EPA concerning the treatment facilities. (Coan-NC)
W79-01840

PROCESS FOR THE PURIFICATION OF INDUSTRIAL EFFLUENTS,
Ciba-Geigy Corp., Ardsley, NY. (Assignee).
H. Wegmuller, and J. Haase.
U.S. Patent No. 4,104,160, 9 p, 11 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Water purification, *Water pollution treatment, Color, Separation techniques, Cellulose, Absorption, Chemical precipitation, Filtration, Paper and pulp industry, Dyes.

A process for the purification of industrial effluents, especially for the decolourisation of waste liquors arising in the textile, paper and leather industry is described where the effluents are brought into contact with cellulosic absorbent which has been pretreated with precipitants. Preferably, filters of cellulose itself or of waste sheets from printing are used. Three processes are suitable for this purpose: the so-called stirring process where the water to be purified is stirred with the pretreated cellulose material in a vessel and the cellulose material and water are then separated; the so-called flow bed process in which the pretreated cellulose material is kept in the suspended state by the counter-current flow of the liquor to be purified; and the so-called filtration process where the liquor to be purified is passed through pre-treated cellulose filter material. Of these three process variants, the filtration process is preferable. (Sinha-OEIS)
W79-01874

METHOD FOR TREATING AQUEOUS WASTES CONTAINING AT LEAST 1% PROTEINACEOUS MATTER,
Nalco Chemical Co., Oak Brook, IL. (Assignee).
G. M. Wein.
U.S. Patent No. 4,104,161, 4 p, 2 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Organic wastes, Separation techniques, Coagulation, *Proteins, Chemical reactions, Rendering plant wastes.

A method is described for treating aqueous wastes containing at least 1% proteinaceous matter with at least 0.20% by weight of cationic water-soluble polyamines. Preferred polyamines include ethylene dichloride-ammonia, quaternary ethylene dichloride-ammonia and dimethylamine-epichlorohydrin-ammonia polymer. The invention is useful in treating rendering plant effluents as well as in treating effluents containing blood and blood serum. (Sinha-OEIS)
W79-01875

PROCESS FOR DETOXIFICATION OF FORMALDEHYDE CONTAINING WASTE WATERS,
Deutsche Gold- und Silber- Scheideanstalt A.G., Frankfurtam-Main (West Germany).
H. Junkermann, and H. Schwab.
U.S. Patent No. 4,104,162, 6 p, 6 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Toxicity, Chemical reactions, *Formaldehyde, Hydrogen peroxide.

Formaldehyde containing waste water is detoxified by treating the waste water with hydrogen peroxide in the presence of alkali at an initial temperature of 10-35C. In an alternative and preferred form of the invention the waste water is heated to a temperature of at least 50C and then 10-35% of the hydrogen peroxide equivalent to the formaldehyde is added. (Sinha-OEIS)
W79-01876

DEVICE FOR TREATING WASTE WATER,
R. G. Chelton.
U.S. Patent No. 4,104,164, 5 p, 2 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 277, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water reuse, Water utilization, Separation techniques, Filtration, Reclaimed water, Impaired water use, Water conservation, Equipment, Cleaning industries, Product recovery.

A process for continuously treating waste water from laundries, car washes and like cleaning establishments to recover water soap, detergents, and other chemilaks is carried out by flowing the untreated water through sand chambers to remove heavy sediment, collecting the water in a storage compartment, pumping the water through a centrifugal separator for removal of large particulate matter and then through a filter containing media for removal of flocculated soaps, detergents, waxes, and other particulate matter, thence into a filtered water storage compartment. The water is pumped from the filtered water storage compartment. The water is pumped from the filtered water storage compartment by a pressure pump. Part of the water containing unused soaps, detergents, conditioning agents, and other chemicals is returned from the filtered water storage compartment for reuse, the other parts enters a filter containing absorptive media for removal of the remaining soaps, detergents, conditioning agents, organic compounds and other chemicals. Backwash water from the filters is returned through a separate bag filter recovering the water and leaving behind solids in the bag for removal and easy disposal. (Sinha-OEIS)
W79-01877

APPARATUS FOR PURIFYING WASTE WATERS,
F. Besik.
U.S. Patent No. 4,104,167, 12 p, 5 fig, 2 tab, 14 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 278, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, *Biological treatment, Water pollution treatment, Water quality control, Chemical reactions, Activated sludge, Chemical precipitation, Flocculation, Equipment.

An apparatus in which contaminants from the raw or waste waters are removed by combined biological-chemical degradation comprises first, second and third chambers. An aeration zone is provided in the first chamber. A slanted plate is located in the second chamber to define an aeration zone which overlies a sludge separation zone. Means for transfering such waters from the equalization zone to the upper region of the aeration zone is provided. The slanted plate provides for a downflow of waters through the aeration zone and an upflow of waters through the sludge separation zone, where due to the lower end of the slanted plate being spaced from the lower portion of the second chamber wall forms a constriction to the flow of sludge separation zone. The height of the sludge separation zone is sufficient to dampen the upward flow of the waters to develop a quiescent region in the upper portion of the sludge separation zone. Means for dispersing air into the active media which is circulated through the upward flow channel is provided. The third chamber has clarifying zone. (Sinha-OEIS)
W79-01880

SLUDGE SETTLING AND DE-WATERING APPARATUS,
S. G. Kiss.
U.S. Patent No. 4,104,168, 6 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 278, August 1, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Sludge disposal, Water purification, Oily water, Separation techniques, Settling basin, Gravity, Waste disposal, Suspended solids, Industrial wastes, Dredge spoil.

Improvements in sludge settling and de-watering apparatus or sludge consolidator means include means to remove oil, fat solids and other lighter than water substances as well as heavier than water substance from residue water. The sludge is processed by vibratory means aided by gravity that is effective to insure that all substances heavier than water are carried by gravity to the bottom of the water mass for discharge. Generally, the sludge consolidator includes a vertically arranged cylinder or tank which comprises three divisions or compartment arranged one above the other. In operation, sludge is collected in and clear water discharged from a middle compartment; heavy solids settling out of the water are collected in the bottom compartment. The upper compartment collects suspended substances that are lighter than water and discharges them through a valved outlet at the upper end. Clear water remaining is filtered and then discharged at a level above the sludge level. (Sinha-OEIS)
W79-01881

PROCESS FOR REMOVING CYANIDE-CONTAINING COMPONENTS FROM AQUEOUS MEDIA,
Treadwell Corp., New York. (Assignee).
A. Muller, and J. M. Schreiner.
U.S. Patent No. 4,105,545, 5 p, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 735-736, August 8, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, *Separation techniques, Ammonia, Bubbles, Ozone, Adsorption, Oxidation, *Cyanides, Adsubble separation, Steel industry.

A method for treating cyanide laden waste water effluents derived from coke-oven operations, blast furnace blowdown and other industrial wastewater is described. The process for removing cyanide-containing components from aqueous media, particularly weak ammonia liquors comprises: contacting the media with bubbles in the presence of a collector to remove a substantial amount of complexed and simple cyanide; and contacting the media with ozone to substantially remove the remaining cyanides. This method is a combination of an adsorptive bubble separation commonly called 'adsubble separation' followed by an ozone oxidation treatment. (Sinha-OEIS)
W79-01884

METHOD AND APPARATUS FOR PURIFICATION OF WATER,
Ebara Infilco Kabushkik Kaisha, Tokyo (Japan). (Assignee).
Y. Kakumoto, M. Kanegawa, T. Iwaizumi, and N. Matsumoto.
U.S. Patent No. 4,105,549, 15 p, 15 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 736-37, August 8, 1978.

Descriptors: *Patents, *Water treatment, *Waste water treatment, *Water purification, Water pollution treatment, Separation techniques, *Activated carbon, Adsorption, Water quality control, Carbon slurry, Packed bed.

Water or waste water is purified by passing it through a packed bed of active carbon. The apparatus comprises a tank having a packed bed formed of active carbon including in the upper portion of the tank at least one tube for flowing in a fluid to be treated into the tank and at last one tube for flowing an active carbon slurry out of the tank. In the lower portion of the tank at least one tube is provided for flowing the treated fluid out of the tank and at least one tube for flowing an active carbon slurry into the tank. In the course of the adsorption treatment the fluid to be treated is passed through the active carbon bed downwardly. During replenishment of the bed, regenerated or fresh active carbon is introduced under pressure into the lower portion of the active carbon bed as a slurry and used active carbon present in the upper portion of the active carbon layer is discharged as a slurry together with solids and colloidal material. (Sinha-OEIS)
W79-01886

OIL-CONTAINING EFFLUENT TREATMENT BY GRAVITY SEPARATION,
British Petroleum Co. Ltd., London (England). (Assignee).
G. F. Oldham.
U.S. Patent No. 4,105,553, 5 p, 2 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 738, August 8, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Oil wastes, *Separation techniques, Water pollution treatment, Filtration, Heating, Graity separation, Oil recovery.

Oil-containing effluent such as refinery or other industrial plant effluent is treated by passing it through a gravity separator and obtaining (1) a wet oil fraction, (2) an aqueous fraction of reduced oil content, and (3) a wet oily sludge. Fractions (1) and (3) are then combined and passed through a pressure filter so that solids are retained and oil and water passed through. The oil and water are then passed to a separator and a reusable oil fraction is recovered and the water fraction is returned to the gravity separator. Fraction (3) requires to be heated to permit the water, oil and solids to separate. (Sinha-OEIS)
W79-01888

LIQUID WASTE PROCESSING SYSTEM,
Combustion Engineering, Inc., Windsor, CT. (Assignee).
E. R. D'Amaddio, and D. N. Enegess.
U.S. Patent No. 4,105,556, 5 p, 1 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 739, August 8, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, Industrial wastes, *Radioactive wastes, Water pollution treatment, Separation techniques, Water quality control, *Filtration, *Reverse osmosis, *Evaporation, Ion exchange, Water reuse, Evaporators.

The liquid waste processing system first chemically treates the waste liquid, second filters out the solid particles of waste liquid in a back-flushable filter, third processes the wastes by a reverse osmosis module, and finallly concentrates the concentrate in a thin-film evaporator. After an appropriate degree of chemical pretreatment, the liquid waste is pumped from the holding tank through a filter which removes a large fraction of the particulate and precipitated solids. The waste liquid is then treated by a reverse osmosis module which results in an extremely pure permeate and concentrate containing the undesirable elements. This concentrate is next passed to a thin-film evaporator which further concentrates the concentrate. The distillate from the thin-film evaporator is recycled to the inlet of the reverse osmosis module while the concentrate is discharged to the solid waste processing system. The permeate from the reverse osmosis module may be further purified by an ion exchanger and either discharged to the environment or recycled into the system as a relatively pure and useful liquid. (Sinha-OEIS)
W79-01890

INTERACTION OF CHLORINE AND ORGANIC MOLECULES--EFFECTS OF INORGANICS,
Rhode Island Univ., Kingston. Coll. of Pharmacy.
For primary bibliographic entry see Field 5B.
W79-01903

WATER REUSE HIGHLIGHTS, A SUMMARY VOLUME OF WASTEWATER RECLAMATION AND REUSE INFORMATION,
American Water Works Association Research Foundation, Denver, CO.
R. D. Heaton, and E. Rehfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 386, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, January 1978. 119 p, 23 fig, 15 tab. OWRT T-0058(7709).

Descriptors: *Water reuse, *Waste water treatment, *Reviews, *Technology transfer, Information exchange, Municipal wastes, *Tertiary treatment, Public health, Legislation, Planning, Water treatment, Water pollution treatment.

This is a comprehensive summary of municipal wastewater reclamation and reuse information gathered by the AWWA Research Foundation. It provided the basis for an ongoing monthly newsletter 'Municipal Wastewater Reuse News'. The volume is separated into the categories of advanced wastewater treatment (AWT), related conferences, health effects research, legislative and funding activities, modeling, position statements, published literature, regulations, water reuse plans and demonstrations.
W79-01978

NORTH SLOPE BOROUGH WATER STUDY, A BACKGROUND FOR PLANNING,
Alaska Univ., Fairbanks. Inst. of Water Resources.
R. A. Johnson, and L. D. Dreyer.
Alaska Department of Natural Resources Report, June 1977. 115 p, 17 fig, 2 append.

Descriptors: *Planning, *North Slope Borough(AK), *Water utilization, *Water supply, *Waste water treatment, *Sewage treatment, Regional analysis, Regional development, *Alaska, Bibliographies, Potable water, Alternative planning, Land use, Arctic, Cold regions, Biological treatment, Anaktuvuk Pass(AK), Atkasook(AK), Barrow(AK), Kaktovid(AK), Nuiqsut(AK), Point Hope(AK), Point Lay(AK), Wainwright(AK).

Water use in the eight villages of Alaska's North Slope Borough is examined to assist in evaluating and planning for present and future water use, treatment, and disposal requirements. Information on location, physical setting, and land use are summarized for Anaktuvuk Pass, Atkasook, Barrow, Kaktovid, Nuiqsut, Point Hope, Point Lay, and Wainwright. An extensive bibliography is appended, and there are sections on alternative technologies in arctic water supply and wastewater treatment, and on foreseeable developments affecting water and land use allocations. About half of rural Alaskan villages need immediate improvement in domestic water supplies and face serious problems of contamination of natural waters with

untreated sewage. Many Alaskan waters are high in iron and manganese, and removal is expensive; however, these metals constitute an aesthetic rather than a health problem. Advanced processes are required to treat brackish and saline waters. For wastewater purification, physical-chemical operations are not normally used in cold regions, but a variety of biological treatment processes are suitable. Septic tanks and facultative lagoons usually must be heated. Important future development in the region include a shift in major construction activity to the Brooks Range foothills and Point Lay coastal plain with intensive oil and gas exploration, and possible coal development near Atkasook. (Lynch-Wisconsin)
W79-01991

5E. Ultimate Disposal Of Wastes

STATE-OF-THE-ART APPLICABILITY OF CONVENTIONAL DENSIFICATION TECHNIQUES TO INCREASE DISPOSAL AREA STORAGE CAPACITY,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W79-01520

FUNGAL DEGRADATION OF ANAEROBICALLY DIGESTED SEWAGE SLUDGE,
Auburn Univ., AL.
W. M. Hagler, Jr., N. D. Davis, and U. L. Diener.
Mycopathologia, Vol. 58, No. 3, page 177-181, 1976. OWRT A-030-ALA(2).

Descriptors: *Sludge degradation, *Sewage sludge, *Anaerobic digestion, *Fungal degradation, Biodegradation, Humus, Sludge disposal, Waste disposal, Cunninghamella elegans, Rhizopus oligosporus, Myrothecium verrycaria.

Sewage sludge is a stable humic material that breaks down slowly with time when mixed with soil. The disposal of sewage sludge is one of the problems of environmental pollution throughout the world. Approximately 455,000 cubic meters of sewage sludge are produced daily in the United States (7). The development of supplementary methods of sewage treatment to be used in tandem with anaerobic digestors are of current interest. Benefits of such a tandem system utilizing fungi would be the acceleration of recycling of waste, supplemental detoxification of sludge, and perhaps even recovery of utilizable protein. The use of fungi to accelerate sludge degradation with the possible side benefits of production of protein or other recoverable metabolites has not been investigated. This paper reports the screening of fifty fungi for their ability to grow on and degrade anaerobically digested sewage sludge and the determination of the level of protein produced by C. elegans on this medium.
W79-01547

MYCOFLORA OF ACTIVATED SEWAGE SLUDGE,
Auburn Univ., AL. Water Resources Research Inst.
U. L. Diener, G. Morgan-Jones, W. M. Hagler, and N. D. Davis.
Mycopathologia, Vol. 58, No. 2, p 115-116, 1976. OWRT A-030-ALA.

Descriptors: *Mycoflora, *Activated sludge, Serial dilution, Sewage sludge, Isolation, *Alabama, Auburn(Ala), *Anaerobically digested sludge, Pollutant identification, *Fungi.

Thirty-eight species of fungi were identified in pure culture after isolation from activated sewage sludge by serial dilution. Nine species and genera were identified that had not been previously reported. In 1963, Cooke (1) published an excellent laboratory guide on the identification of fungi from polluted water, sewage, and sewage treatment systems; of approximately 30 papers cited only one (2) dealt with fungi from activated sewage sludge. Later (1970), Cooke and Pipes (3) enumerated 47 fungi consisting of 4 genera of yeasts and 33 genera of filamentous fungi that had been isolated from activated sludge. This paper reports the mycoflora of anaerobically digested sludge from a residential area in Auburn, Alabama.
W79-01548

MOBILE CENTRIFUGAL UNIT FOR USE IN DEWATERING PAPER SLUDGES (DIE FAHRBARE ZENTRIFUGENANLAGE BEIM EINSATZ ZUR ENTWAESSERUNG VON PAPIERSCHLAEMMEN),
VEB Komplette Chemieanlagen, Dresden (East Germany).
K. Rodel, M. Marcz, A. Hilbert, and M. Bergmann.
Zellstoff und Papier, Vol. 27, No. 2, p 80-82, March-April, 1978. 4 fig, 3 illus.

Descriptors: *Sludge treatment, *Dewatering, *Centrifugation, Sludge, Wastes, Industrial wastes, Laboratory equipment, Pulp wastes, Pulp and paper industry, Solid wastes, Foreign countries, Europe, East Germany.

Since 1976 a mobile laboratory equipped for cntrifuging and sludge dewatering has been used in East Germany for preliminary evaluation of papermill sludges before planning and constructing dewatering equipment. The unit and its use are described. (Ward-IPC)
W79-01606

IMPACT OF RESIDUAL BIOSOLIDS ON RECEIVING WATER QUALITY,
For primary bibliographic entry see Field 5C.
W79-01609

CHARACTERISTICS AND USE OF NONSETTEABLE SOLIDS BY AN AQUATIC FOOD CHAIN ORGANISM,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5C.
W79-01617

BIOLOGICAL IMPACT OF VARIOUS CHLORINATED PHENOLICS AND RELATED COMPOUNDS ON DAPHNIA MAGNA,
State Univ. of New York Coll. of Environmental Science and Forestry, Syracuse.
For primary bibliographic entry see Field 5C.
W79-01618

APPLICATION OF GEOTECHNICAL THEORIES TO THE LANDFILL DISPOSAL OF PAPERMILL SLUDGES,
Maine Univ. at Orono. Dept. of Civil Engineering.
R. E. Wardwell, S. R. Cooper, and W. A. Charlie.
Presented at TAPPI Environmenta Conference, Washington, D.C., April 12-14, 1978, Preprinted Proceedings, (TAPPI, Atlanta, Georgia 30338), p 193-206. 11 fig, 12 ref.

Descriptors: *Sludge disposal, *Landfills, *Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Solid wastes, Design, Operation and maintenance, Activated sludge, Sludge, Soil mechanics, Consolidation, Permeability, Field tests, Laboratory tests, Soil stability, Maine, Ultimate disposal, Disposal, Water pollution control.

Many of the environmental problems associated with the design and operation of sludge landfill disposal sites may be related to a lack of information about the geotechnical behavior of activated sludge. Basic soil mechanics theories of consolidation, shear strength, and permeability are presented along with their relationship to the performance of pulp and paper mill sludge. The results of laboratory tests and field observations are summarized and briefly discussed. The use of soil mechanics methods to consolidate the sludge and thus increase the stability of the deposit is illustrated at Boise Cascade Corp.'s landfill site located on the eastern slope of Farrington Mountain in Mexico, Maine. (Swichtenberg-IPC)
W79-01620

LIQUID MANURE AND ENVIRONMENT PROTECTION, (IN GERMAN),
A. Forster.
Landtechnik, Vol. 27, No. 8, p. 166-168, April, 1972. 5 fig.

Descriptors: *Liquid wastes, Odor, Regulation, Transportation, *Farm wastes, *Field spreading, Sweden, Switzerland.

A great number of farmers use liquid dung as manure on their fields because transportation costs for this method can be reduced by 30-40%. Several European contries provide for special environment protection measures to be applied in this case. Similar to the regulations for the storing of oils and chemical agents, those for storing and utilizing liquid manure will depend on whether the drinking water in the various regions is endangered by the liquid dung. In Sweden and Switzerland, storing liquid dung for 4-9 months is obligatory because after this time a great number of pathogenic microorganisms are destroyed and risk is considerably reduced. Another reason is that during special periods such as holidays or in high pressure areas, spraying liquid dung onto the fields is not allowed in order to prevent the formation of bad odors. Large farms will have to provide for dung deodorization in the future in order to avoid the present disadvantages of dung utilization. Dung deodorization can be effected mechanically, thermally, chemically, or biologically; the latter seems to be the most perfect and economical method. The biological treatment can be effected in a cold, warm or hot way, however, the cold method is the least advantageous since the fertilizing value in its liquid phase is extremely low. Dung treated in this manner can be distributed by means of a spraying device without causing difficulties, however, it will be economical only for farms with an annual dung production of more than 8,000 cu m of liquid dung. Smaller farms should use the new glass-fiber truck-mounted tanks of a volume of 8,000 liters. (Solid Waste Information Retrieval System)
W79-01628

FIELDS OF USE AND APPLICATION OF MANURE AND MANURE DISPOSAL, (IN GERMAN),
V. G. Blanken.
Landtechnik, Vol. 25, No. 21, p. 674-676, November, 1970.

Descriptors: *Fertilizers, *Waste treatment, *Waste disposal, Incineration, Drying, Economics, Groundwater, *Farm wastes, *Dumping, Land spreading.

Manure can be used for fertilizing agricultural areas, it can be dumped, destroyed by chemicals, biologically decomposed or incinerated. Its use as fertilizer is still the most economic method for disposal of manure, provided that there is agriculture in the area. If not, one of the other methods must be selected. Drying has proved to be economical only in the case of chicken manure. Drying costs for the manure of about 40,000 chickens run at DM 7.00. Conversion into humus is justified only if there is a sufficiently large market for the product. Costs are DM 10.75 for 8,000 chickens. In the absence of a market for manure, it seems to be best to subject it to biological decomposition. There is, however, the problem of disposal of the residual matter. Incineration would be the best method from a sanitary point of view, but it is too expensive. Dumping is too dangerous for the environment. Pollution of the environment by larvae and worm eggs can be avoided, by storing the manure in large containers for long periods of time. For protection of the groundwater small amounts of manure ought to be spread over the fields at one time, and used on flat acres only. (Solid Waste Information Retrieval System)
W79-01633

UTILIZATION AND DISPOSAL OF LIQUID MANURE AT SMALL AVAILABLE SPACE, (IN GERMAN),
V. H. Traulsen.
Landtechnik, Vol 25, No. 21, p. 665-668, November, 1970. 7 fig, 7 ref.

Descriptors: *Liquid wastes, *Waste treatment, *Waste disposal, Economics, Odor, Groundwater pollution, Pathogens, Incineration, Drying, *Farm waste, Land spreading, Spraying, Composting, Oxidation tanks, Germany.

Of the manure disposal and utilization methods, spraying of liquid manure over crops is the least expensive one. Generally 40-60 cbm liquid manure can be applied per hectare and year. Some plats such as corn are able to consume up to 100 cbm per hectare and year, asparagus as much as 200 cbm. Pathogenic germs are not killed by this method. In the German Democratic Republic, it is required to store manure for 21 days before it is applied to the fields. Studies have shown that salmonellas survive almost one year in liquid manure. Other drawbacks of this method are that the manure cannot be applied to the fields at each season since it causes annoying odors and pollutes groundwater. Spreading over areas which are then withdrawn from agricultural use for one or more years bears the same disadvantages. Composting by mixing with lime, peat, and styropor has not been done yet with any manure other than chicken manure. Decomposing in lagoons does not kill all pathogenic germs either. Anaerobic decompostion is too expensive. Incineration is the most hygenic method but it involves high investment and operating costs. Composting and drying and oxidation tanks are the most economical methods available at the moment. (Solid Waste Information Retrieval System)
W79-01640

A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 5C.
W79-01643

WEIR DESIGN TO MAINTAIN EFFLUENT QUALITY FROM DREDGED MATERIAL CONTAINMENT AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W79-01655

EFFECTS OF TURBIDITY AND SUSPENDED MATERIAL IN AQUATIC ENVIRONMENTS, LITERATURE REVIEW,
Wisconsin Univ., Stevens Point. Dept. of Biology; and Louisiana State Univ., Baton Rouge. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W79-01656

AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO; EVALUATIVE SUMMARY,
State Univ. of New York, Buffalo. Great Lakes Lab.
R. A. Sweeney.
Available from the National Technical Information Service, Springfield, VA 22161, as ADA-055 865 Price codes: A07 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-42, June 1978. 125 p 6 tab, 19 fig, 46 ref.

Descriptors: *Aquatic environment, Environmental effects, *Lake Erie, *Dredged material disposal, *Waste disposal site, *Ashtabula River.

Evaluates impacts of the release of dredged material on chemical and physical aspects of the aquatic and benthic environments as well as phytoplankton, zooplankton, benthos, and fish in Lake Erie off Ashtabula, Ohio, from June 1975 through September 1976. Samples and measurements were taken prior to, during, and after the release of materials from a hopper dredge during August 1975 and May 1976. Impacts on the water column including the phytoplankton zooplankton communities were short lived. While the benthos as well as the chemical and physical nature of the sediments were altered, predisposal conditions generally were reestablished within a year after the release of the dredged material. Storm event related erosion of the dredged material appeared to be a major factor in the recovery of the area. There was no evidence of accelerated uptake of heavy metals by fish or benthos as a consequence of disposal. Harbor macroinvertebrates, transported with the dredged materials, did become established in the depositon area. With the exception of the latter, the obseved impacts were similar to those noted in studies to evaluate the impact of dredged materials on the marine environment. (WES)
W79-01657

USE OF DREDGED MATERIAL ISLANDS BY COLONICAL SEABIRDS AND WADING BIRDS IN NEW JERSEY,
Manomet Bird Observatory, MA.
F. G. Buckley, and C. A. McCaffrey.
Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-78-1, June 1978. 205 p, 4 append. 9 tab, 47 fig, 49 ref.

Descriptors: *Birds, *Shore birds, *Islands, *New Jersey, *Dredged material, *Colonial birds.

Use of dredged material islands by colonial nesting seabirds and wading birds in New Jersey was examined in five major phases. The first located dredged material islands from Manasquan to Cape May Inlets, NJ; the second recorded the past history of all colonial nesting seabirds and wading birds in New Jersey; the third recorded the vegetation patterns and succession on 21 dredged material islands; the fourth recorded the distribution in 1977 of colonial seabirds and wading birds in the study area and their utilization of dredged material islands; and the fifth documented those factors influencing the use and selection of dredged material islands by birds in 1977. Plant communities were placed into 15 categories. The most important ones for birds on the dredged material study islands were bare, common reed, reed-shrub, shrub, shrub-forest, shrub-dense grassland, and dense grassland. No statistically significant vegetation differences were found between the bird (colony) and vegetation (non-colony) study islands, thus other factors, notably microtopography, past history of colony success, and freedom from disturbance by quadruped predators and humans, seem most important in determining island use by birds, given certain minimal habitat requirements. Nineteen management recommendations for dredged material islands are stated. (WES)
W79-01658

A COMPARISON OF PLANT SUCCESSION AND BIRD UTILIZATION ON DIKED AND UNDIKED DREDGED MATERIAL ISLANDS IN NORTH CAROLINA ESTUARIES,
North Carolina Univ. at Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-01659

A STUDY OF LEACHATE FROM DREDGED MATERIAL IN UPLAND AREAS AND/OR IN PRODUCTIVE USES,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5B.
W79-01660

SOME FACTORS AFFECTING DENITRIFICATION IN SOILS IRRIGATED WITH WASTEWATER,
Ohio State Univ., Columbus. Dept. of Agronomy.
S. S. Barr, R. H. Miller, and J. T. Logan.
Journal Water Pollution Control Federation, Vol. 50, No. 4, p 709-717, April, 1978. 6 fig, 5 tab, 17 ref. OWRT B-059-OHIO(2).

Descriptors: *Denitrification, *Spray irrigation, *Soil amendments, *Carbon, *Hardwood, Grasses, Return flow, Clay loam, Sands, Nitrates, Nitrogen fixing bacteria, Application methods, Waste water treatment, Waste water disposal, Municipal wastes.

Biological denitrification was investigated at soil sites irrigated with waste water by the Pennsylvania State University waste water management project. The three clay loam soil sites included a plot of reed canarygrass, a hardwood forest, and an abandoned field; the fourth mixed hardwood site was formerly designated as gameland and consisted of loamy sand. The sites had been spray irrigated with waste water since 1963; untreated control sites were also maintained and soil samples were collected at various depths four times in two years. The top 7.5 cm of the treated soil sites contained the highest organic carbon and total nitrogen levels, and carbon/nitrogen ratios. All soils and vegetation exhibited low denitrification potentials attributed to a shortage of available organic carbon. This assumption was supported when denitrification increased after glucose was added to the soils as a carbon source. Carbon supplements added in the form of plant residues in the wastewater could not support denitrification below the 15 cm root zone, indicating that excess nitrate would leach into the groundwater. Reducing nitrogen levels in the waste water and increasing carbon sources during periods when crops were not grown was recommended. (Lisk-FIRL)
W79-01729

USE OF FECAL STREPTOCOCCI AS INDICATORS OF POLLUTION IN SOIL,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W79-01738

STUDIES OF FLOCCULATION AND SEDIMENTATION TREATMENT OF PULP MILL EFFLUENT (PART 3) - RECOVERY AND REUSE OF ALUM SLUDGE (PARUPU HAISUI GYOSHU SHORIHO NO KENKYU (DAI-SANPO) - RYUSAN ARUMINYUMU SHORI SURAJI NO KUROZU KA SHORI),
T. Horikoshi, O. Ebinuma, and M. Yamagoshi.
Kami Pa Gikyoshi (Jour of the Japanese Technical Assoc. of Pulp and Paper Industry), Vol. 32, No. 10, p 46-51, 1978. 13 fig, 7 ref.

Descriptors: *Flocculation, *Recycling, *Pulp wastes, *Sludge disposal, *Pulp and paper industry, Separation techniques, Coagulation, Air pollution control, Sludge treatment, Chemical oxygen demand, Color, Industrial wastes, Waste water treatment, Waste water disposal.

Research at the Oji Paper Co., Ltd., in Japan on the flocculation and treatment of pulp mill effluent examined methods to recover and reuse alum sludge as a coagulant for COD and color removal. Alum recovery was achieved by reaction of kraft pulp effluents with sulfuric acid which had been generated using sulfur dioxide from boiler stack gases. Alum sludge ash prepared at pH 12.0 with Ca(OH)2 was successfully recovered by treatment with sulfuric or hydrochloric acid, followed by incineration at 900C. Alum sludge prepared at a low pH of 5-8 was treated with lime or calcium carbonate before incineration; this method also provided a reusable product. Closed systems were designed for both the high and low pH sludges. The low pH system incorporated mixing with alum and lime, clarification, mixing with lime and calcium carbonate, dewatering, incineration, reaction with sulfuric or hydrochloric acid, and separation of insoluble materials before recycling of the alum to the first stage of the treatment process. The system could be augmented with desulfurization of stack gases to provide the sulfuric acid. (See also W76-09284) (Schulz-FIRL)
W79-01758

Group 5E—Ultimate Disposal Of Wastes

STATE OF THE ART REPORT ON PESTICIDE DISPOSAL RESEARCH,
Midwest Research Inst., Kansas City, MO.
R. R. Wilkinson, E. W. Lawless, A. F. Meiners, T. L. Ferguson, and G. L. Kelso.
ACS Symposium Series, No. 73, p 73-80, 1978. 22 ref.

Descriptors: *Incineration, *Pesticides, *Ozone, *Ultraviolet light, *Industrial wastes, *Biological treatment, Herbicides, 2,4-D, DDT, Organic pesticides, Carbamate pesticides, Total organic carbon, Costs, Pesticide removal, Waste treatment, Waste water treatment.

A state-of-the-art review of pesticides disposal research is presented with particular emphasis on high-temperature incineration, physicochemical methods, and bioconversion technology. High-temperature incineration has been employed for organic pesticides, Kepone, Mirex, organochlorine process wastes, and Herbicide Orange; efficiencies of up to 99.9% are possible with incineration although capital costs are high and scrubbing may be required. A data base covering incineration of pesticides has been established. Chlorolysis, Zimpro wet oxidation, and ozone/ultraviolet (UV) irradiation comprise the current chemical treatment methods used for pesticides. Wet oxidation with air or oxygen has yielded substantial reductions in total organic carbon (TOC) levels of wastes containing DDT, 2,4-D, pentachlorophenol, Amiben, and Atrazine; further studies to monitor the effects of wet oxidation on the active ingredients, rather than TOC alone, are recommended. Chlorolysis has been proven particularly effective for high chlorinated and diene-based pesticides. Ozone/UV irradiation has been optimized for chlorinated hydrocarbons, organophosphates, and carbamates. Microbial degradation has been successfully employed to decompose parathion into simpler phosphoric acids and phenols. (Schulz-FIRL)
W79-01764

A BIOLOGICAL ASSESSMENT OF FISH AND BENTHIC POPULATIONS INHABITING A KRAFT MILL EFFLUENT CHANNEL,
Florida Univ., Gainesville. School of Forest Resources and Conservation.
For primary bibliographic entry see Field 5C.
W79-01774

LEATHER TANNING INDUSTRY-SLUDGE PROBLEMS AHEAD,
R. Dawson.
Sludge Magazine, Vol. 1, No. 5, p 24-27, September-October, 1978.

Descriptors: *Chromium, *Tannery wastes, *Sludge disposal, *Heavy metals, *Industrial wastes, Ultimate disposal, Recycling, Fertilizer, Sludge treatment, Dewatering, Oxidation, Waste water treatment.

Approximately 80-85% of the leather tanned by the 298 tanneries in the U.S. is treated by chromium processes which generate large quatities of potentially hazardous sludge containing Cr(III), Zn, Pb, and Cu. A tabulation by states and regions of the projected leather tannery waste generation is presented for the wet and dry total process solid waste and total potentially hazardous wastes for 1977 and 2983. A survey by SCS Engineers noted that filter pressing was the preferred method for dewatering sludge and that 60% of the sludge was ultimately landfilled. New EPA standards for hazardous waste disposal are anticipated to be proposed during 1979. Current studies are examining methods to recover the chromium and the effects of using tannery sludges as soil conditioners or fertilizers. The APS catalytic molten salt incineration system is designed to burn off the organics and produce a chromium-rich ash. (Schulz-FIRL)
W79-01779

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01839

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01840

POLLUTION CONCENTRATIONS IN RUNOFF WATER FROM REFUSE PILES,
Auburn Univ., AL. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W79-01892

ECOLOGY AND PATHOLOGY OF WILDLIFE IN RESPONSE TO SPRAY IRRIGATION OF CHLORINATED SEWAGE EFFLUENT - PHASE I,
Pennsylvania State Univ., University Park. Coll. of Agriculture.
For primary bibliographic entry see Field 5C.
W79-01902

NORTH SLOPE BOROUGH WATER STUDY, A BACKGROUND FOR PLANNING,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W79-01991

MATHEMATICAL MODELS OF DISSOLVED OXYGEN CONCENTRATION IN FRESH WATER,
Stevens Inst. of Tech. Hoboken, NJ.
For primary bibliographic entry see Field 5C.
W79-01998

5F. Water Treatment and Quality Alteration

VIRUSES IN FINISHED WATER: THE OCCOQUAN EXPERIENCE,
Health Effects Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W79-01577

STUDY OF WATER TREATMENT EFFECTS ON ORGANIC VOLATILES IN DRINKING WATER,
Alabama Univ., University. Dept. of Chemistry.
M. Thomason, M. Shoults, W. Bertsch, and G. Holzer.
Journal of Chromotography, Vol. 158, p. 437-447 1978. 3 fig, 3 tab, 43 ref. OWRT A-056-ALA(1).

Descriptors: *Water treatment, Gas chromatography, *Mass spectroscopy, Hydrocarbons, Volatile organics, *Pollutant identification.

Volatile organics were determined during all stages of the water treatment process in a municipal water works. Analytical parameters for a quantitative procedure were investigated. The method used allows simultaneous determination of both halogenated and non-halogenated purgeable organics. Approximately 70 substances were identified by gas chromatography-mass spectrometry with capillary columns. Well water contained considerable quantities of aliphatic and aromatic substances. Halocarbons were formed during both steps of a double chlorination procedure, but the largest quantity was generated during the first step. Only tetrachloroethylene was present in untreated surface water in significant quantities. Most hydrocarbons were carried through the treatment process from the raw water to the finished water with little change in concentration.
W79-01722

MODEL AIDS MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,
Mississippi Water Resources Research Inst., Oxford.
For primary bibliographic entry see Field 5G.
W79-01741

BDELLOVIBRIO AND THE INTESTINAL FLORA OF VERTEBRATES,
Auburn Univ., AL. Dept. of Microbiology.
J. M. Westergaard, and T. T. Kramer.
Applied and Environmental Microbiology, Vol. 34, No. 5, p 506-511. Nov. 1977, 3 fig, 15 tab, 19 ref. OWRT B-061-ALA(3).

Descriptors: *Bdellovibrio, Alimentary tract, *Intestinal microflora, *Bacteria, Water pollution effects, Potable water, Water treatment, *Nonpathogenic bacteria.

Bdellovibrio strain MS7 force-fed to fish and frogs via an intragastric tube did not become an integral component of the intestinal microflora. Strain MS7 fed to mice in drinking water was not recovered from the intestinal tract of mice. However, in vitro, the organism multiplied in intestinal contents of frogs and mice. Bdellovibrio inoculated into rabbit ileal loops was greatly reduced in number within 24 h. It was concluded that strain MS7 could be considered nonpathogenic to animals, at least when introduced into the digestive tract, and that it is not feasible at the present time to lyse pathogenic, gram-negative bacteria in the alimentary tract with Bdellovibrio.
W79-01742

METHOD OF SEPARATION OF FLUORIDE ION FROM WATER,
M. Kanai.
U.S. Patent No. 4,104,159, 7 p, 2 fig, 2 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 276, August 1, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Separation techniques, Fluorides, Adsorption, Flocculation, Electrolysis.

To remove fluoride from raw water, whether the fluoride is in solution as an ion or in the form of a colloidally-dispersed salt, calcium ions are first introduced into the water. The resultant calcium fluoride is adsorbed on a floc during passage of electric current through the raw water. The floc may be formed from organic matter already present in the raw water or from diatomaceous earth floc in a separate operation, the diatomaceous earth floc then being added to the raw water. Adsorption on floc whether originating in organic matter or in diatomaceous earth is facilitated by the passage of electric current through the raw water and by the addition of a surfactant. (Sinha-OEIS)
W79-01873

WATER SOFTENING SYSTEM,
J. W. Braswell.
U.S. Patent No. 4,104,165, 9 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 277, August 1, 1978.

Descriptors: *Patents, *Water treatment, *Water softening, Hardness(Water), Water purification, Ion exchange, Separation techniques, Resins, Flow control, Regeneration.

The water softening system employs a treatment tank containing a mineral bed of ion-exchange resin granules, a brine tank, and valve means for periodically cycling water through the mineral bed for removing hardness and other undesirable factors. Then a saturated brine solution is passed through the bed counter-current to its normal service flow to recondition it and subsequently the bed is flushed to cleanse the granules and remove all undesirable matter. The control means for the system includes electrically operated solenoid diaphragm valves, and a plunger valve responsive to water pressure, for controlling and regulating the flow of water and brine through the mineral bed.

Venturi aspirator means are incorporated in the plunger valve, so that a saturated brine solution is drawn, in a direction counterflow to service flow through mineral beds. The bed is flushed with water in successive counterflow and concurrent flow directions to cleanse, rinse and resettle the bed in preparation for the subsequent service cycle. (Sinha-OEIS)
W79-01878

WATER REUSE HIGHLIGHTS, A SUMMARY VOLUME OF WASTEWATER RECLAMATION AND REUSE INFORMATION,
American Water Works Association Research Foundation, Denver, CO.
For primary bibliographic entry see Field 5D.
W79-01978

5G. Water Quality Control

APPLICATION IN THE WATER INDUSTRY OF REGIONAL GEOCHEMICAL MAPS OF ENGLAND AND WALES,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5B.
W79-01501

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY,
Alabama Univ., University. Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 4A.
W79-01510

SEDIMENT CONTROL CONFERENCE, HELD AT HELENA MONTANA ON DECEMBER 15, 1972.
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 4D.
W79-01523

THE EFFECT OF IRRIGATION ON THE SURVIVAL AND DEVELOPMENT OF PARASITIC NEMATODE LARVAE IN WESTERN MONTANA,
Montana State Univ., Bozeman.
For primary bibliographic entry see Field 5C.
W79-01540

HYDROLOGIC CHARACTERISTICS OF COAL-MINE SPOILS, SOUTHEASTERN MONTANA,
Montana Coll. of Mineral Sciences and Technology, Butte.
For primary bibliographic entry see Field 5B.
W79-01542

IMPROVEMENT AND EVALUATION OF TECHNIQUES FOR THE MECHANICAL REMOVAL AND UTILIZATION OF EXCESS AQUATIC VEGETATION,
Wisconsin Univ.-Madison. Dept. of Mechanical; and Wisconsin Univ.-Madison. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W79-01584

INVESTMENT PLANNING FOR COLORADO RIVER SALINITY CONTROL,
California Univ., Los Angeles. Graduate School of Management; and California Univ., Los Angeles. Dept. of Engineering Systems.
D. Erlenkotter, and C. R. Scherer.
In: 'Colorado River Basin Modeling Studies' Seminar Proceedings, held July 16-18, 1975 Published March 1976, Utah Water Research Laboratory, Logan, p. 71-85. 1 fig, 2 tab, 11 ref, (California Water Resources Center Project UCAL-WRC-W-474). OWRT B-170-CAL(1).

Descriptors: *Mathematical models, *Colorado River, *Salinity control, Costs, Economics, Model studies, Investment, Planning.

This study considers the problem of scheduling investment in salinity control projects on the Colorado River. Each project offers the possibility of preventing an amount of salt from entering the river. Diversions (consitent with 'present modified' flows) are made along the river for various users. These users (primarily lower basin) incur damage as river salinity rises with time due to intensifying use upstream. The problem is to find that schedule of investments which minmizes the discounted sum of project investment and operating costs, ad downstream salinity damages over time, subject to optional equity-oriented restrictions on (1) financing arrangements and (2) quality at selected points along the river. Note that while quality restrictions are mentioned, they are optional. Hence this is more than a cost-effective analysis. Rather, the approach taken is to let the salinity profile of the river be determined endogenously within the model, with the optimal timing of investment based on the dynamic trade-off of investment costs and associated downstream damages. (Snyder-Calif, Davis)
W79-01587

A PRELIMINARY ECOLOGICAL SURVEY OF DARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
Arkansas Water Resources Research Center, Fayetteville.
For primary bibliographic entry see Field 6G.
W79-01591

ADVENTURES IN DESIGNING FOR 1984 EFFLUENT REDUCTION,
Gulf States Paper Corp., Tuscaloosa, AL.
R. R. Fuller.

Descriptors: *Pulp and paper industry, *Water pollution control, *Treatment facilities, *Legislation, *Design, *Alabama, Pulp wastes, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Biological treatment, Tertiary treatment, Solid wastes, Biochemical oxygen demand, Freshwater, Water purification, Water reuse, Recycling, White liquor(Kraft process), Green liquor(Kraft process), White water(Paper machines), Kraft mills.

A review is presented of the impact of proposed 1984 effluent discharge regulations on the design of water pollution control facilities at an integrated kraft pulp and paper mill in Tuscaloosa, Alabama. Existing treatment facilities (including the UNOX biological process) and tertiary treatment alternatives are discussed in terms of their potential for removing solid wastes, 5-day BOD, and effluent solids generated during pulp washing and screening, green and white liquor and fresh water clarification, evaporatory clean-out, and white water recycling. (Swichtenberg-IPC)
W79-01608

SURVEY OF ORDERS OF CONDITIONS (UNDER WETLANDS PROTECTION ACT) OF THE CONSERVATION COMMISSIONS OF CAPE COD, 1973-1977.
Association for the Preservation of Cape Cod, Orleans, MA.
For primary bibliographic entry see Field 6E.
W79-01631

NBC REQUESTS EXEMPTION FROM RUNOFF RULES.
Feedstuffs, Vol. 48, No. 6, p 22, February 9, 1976.

Descriptors: *Poultry, *Regulation, Water pollution, *Broilers, *National Pollutant Discharge Elimination System.

The National Broiler Council (NBC) has filed a request with the Environmental Protection Agency asking an industry exemption from proposed regulations that would require National Pollutant Discharge Elimination System (NPDES) permits for large broiler operations. Broiler growout operations with more than 290,000 birds for a cumulative total of 45 days in any 12-month period would be considered a 'concentrated animal feeding operation point source' in the eyes of the regulation. In the event EPA cannot grant an industry exemption, NBC said the criteria for determining whether a broiler operation has a measurable discharge of pollutants into navigable waters should be clarified. (Ott-East Central)
W79-01649

KANAWHA RIVER INVESTIGATION OF WATER QUALITY AND WATER POLLUTION CONTROL PRACTICES. VOLUME II: REPORTS OF INDUSTRIAL INVESTIGATIONS ON SEVEN INDUSTRIES.
Environmental Protection Agency, Washington, D.C. Office of General Counsel.
For primary bibliographic entry see Field 5D.
W79-01654

WEIR DESIGN TO MAINTAIN EFFLUENT QUALITY FROM DREDGED MATERIAL CONTAINMENT AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
T. M. Walski, and P. R. Schroeder.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-056 062 Price codes: A06 in paper copy, A01 in microfiche. Technical Report-D-78-18, May 1978. 106 p, 3 append, 33 fig, 35 ref.

Descriptors: *Effluents, *Weirs, *Stratified flow, Suspended solids, Design criteria, *Containment area, *Dredged material.

The suspended solids concentration in the effluent water from an upland containment area being filled with fine-grained dredged material can be significantly influenced by the length of the weir and the depth of the ponder water. This study develops a procedure for designing and operating the weir to maintain good effluent quality, given a flow and dredged material type. Stratified-flow and sediment-transport models were investigated to describe the depth of withdrawal, velocity profile, and effluent suspended solids concentration, given a concentration profile and flow. Field data on these parameters were collected at three sites--Yazoo River, MS, Fowl River, Al, and Oyster Bay, AL. The Waterways Experiment Station's selective withdrawal model developed by Bohan and Grace, modified to fit observed data, was selected as the basis of the design procedure. Using this model, nomograms were developed for the design procedure for silt and saltwater clays ad for freshwater clays. Proper operation of the weir can ameliorate the effects of short-circuiting or an undersized basin. In general, the weir crest should be maintained at as high an elevation as feasible during dredging operations. Guidance for operation of the weir for special applications is also presented. (WES)
W79-01655

PRELIMINARY GUIDE TO WETLANDS OF THE WEST COAST STATES; MAJOR ASSOCIATIONS AND COMMUNITIES IDENTIFIED.
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2I.
W79-01665

CHARACTERIZATION AND REUSE OF ASH POND EFFLUENTS IN COAL-FIRED POWER PLANTS,
Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 5C.
W79-01674

NITRAPYRIN DEGRADATION AND MOVEMENT IN SOIL,
Georgia Univ., Experiment. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.

W79-01706

FERTILIZATION DECISION MODEL-A SYNTHESIS OF SOIL AND PLANT PARAMETERS IN A COMPUTERIZED PROGRAM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W79-01714

EFFECT OF NITRAPYRIN ON NITRIFICATION OF FALL AND SPRING-APPLIED ANHYDROUS AMMONIA,
Illinois Univ. at Urabana-Champaign. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-01717

IRRIGATION TIMING-ITS INFLUENCE ON THE EFFECTS OF SALINITY AND WATERLOGGING STRESSES IN TOBACCO PLANTS,
Victoria Dept. of Agriculture, Tatura (Australia). Horticulture Research Station.
For primary bibliographic entry see Field 3F.
W79-01720

DECISION MAKING IN A MULTIPLE-USE APPROACH TO THE RECLAMATION OF STRIP-MINED LANDS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. School of Renewable Natural Resources.
A. Goicoechea, L. Duckstein, and M. Fogel.
In: Hydrology and Water Resources in Arizona and the Southwest, Vol. 7. Proceedings of the 1977 Meetings of the Arizona Section, American Water Resources Assn.; and the Hydrology Section, Arizona Academy of Science, April 15-16, Las Vegas, Nevada, p 69-78. 1 fig, 4 tab, 13 ref. OWRT B-043-ARIZ(27), B-055-ARIZ(1).

Descriptors: *Model studies, *Mathematical models, *Decision making, *Multiple-purpose projects, *Strip mine wastes, *Reclamation, Arizona, Black Mesa, Livestock, Runoff, Mine wastes, Flow augmentation, Farming, Crops, Sediment control, Fish harvest, Ponds.

Using the Black Mesa area in northern Arizona, a case study was made based on a decision making algorithm called PROTRADE (Probabilistic Tradeoff development Method). Five objectives to be achieved in reclaiming this overgrazed and now mine-spoiled acreage were considered: (1) livestock production, (2) augmentation of water runoff), 3) farming of selected crops, (4) control of sedimentation rates, and (5) fish ponds harvesting. The methodology employed in this study is given by way of formulae applied to each of these objectives. Results indicate that the algorithm allows for objectives were in conflict and competition with each other, particularly in competition for water, goal values obtained were short of their maximum value of unity, with sediment being the exception. By expressing the functions of the objectives in their respective natural units, rather than in dollars, however, the decision maker is able to bring social, environmental, and aesthetic concerns into the analysis. The authors believe that the applicability of PROTRADE to realistic problems is feasible. (Paylore-Arizona)
W79-01730

A NONSTRUCTURAL APPROACH TO CONTROL SALT ACCUMULATION IN GROUND WATER,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg.
Ground Water, Vol. 15, No. 1, p 51-57, January-February 1977. 9 fig, 1 tab, 6 ref. OWRT A-060-CAL(1).

Descriptors: *Groundwater, *Water pollution, *Salts, *Irrigation, Salinity, Wells, Water wells, Irrigation wells, Aquifers, Dissolved solids, Water quality, Leaching, Groundwater recharge, Seepage, Infiltration, Agriculture, *Groundwater protection, Groundwater salinity.

One of the more subtle and dangerous areas of pollution is that occurring in groundwater from normal irrigation practices. The pollution from salt buildup is presently one of the unsolved problems in managing stream-aquifer systems. This paper presented several strategies that offer a possibility of controlling salt buildup. For example, instead of applying irrigation groundwater near the site of a well, the ASTRAN Method, described herein, transfers it downstream to be applied on land where the groundwater is a lower quality, thereby controlling the increase in salt concentration. Instead of preventing seepage loss in delivery canals, the percolating water is used to maintain groundwater quality. Finally, timed releases of return flow remove salts, without exceeding surface water quality constraints. (Sims-ISWS)
W79-01735

CONSUMER ATTITUDES TOWARD TASTE AND ODOR IN WATER,
California Univ., Berkeley. School of Public Health.
For primary bibliographic entry see Field 6B.
W79-01739

MODEL AIDS MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,
Mississippi Water Resources Research Inst., Oxford.
K. W. Hollman, E. E. Milam, J. H. Sellers, R. F. Bush, and J. F. Hair, Jr.
Water and Sewage Works, Reference edition, p R-114-R-125. April 1978, 7 tab. OWRT A-116-Miss(1).

Descriptors: *Municipal water systems, *Model studies, *Cost efficiency, Performance, *Planning, Debt, Depreciation, Controllable cost, Uncontrollable cost, Multivariate, Pumpage, Treatment costs, Distribution systems, Water supply, Water treatment, *Mississippi water systems.

The objective was to generate a multivariate analytical model, using data from 45 Mississippi water systems as an information base, that would provide answers to these questions: (1) What factors play a part in achieving greater proficiency in regulating operating costs, and (2) To what extent do these factors affect efficiency. The criterion (dependent) variable consists of average total cost (ATC) per gallon of water; the twenty-two predictor (independent) variables are divided into four major costs/operations categories. The model (primarily using multiple discriminant analysis) measures several cost factors at varying levels of cost per gallon of delivered water for the one-third of the systems that were most efficient, the one-third that were the next most efficient, and the one-third that were least efficient. It identifies those economic, demographic, and water-related factors that are most closely associated with efficient water firms. Findings of the study will enable water system managers to determine the prevailing standards of cost performance in the industry and to bring current performance in line with industry averages. Findings will also be helpful to regulatory authorities and others interested in the most efficient use of water resources.
W79-01741

MORPHOLOGICAL VARIATION OF ELODEA IN WESTERN MASSACHUSETTS: FIELD AND LABORATORY STUDIES,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01743

THE SPREAD OF SEVERAL INTRODUCED OR RECENTLY INVADING AQUATIC IN WESTERN MASSACHUSETTS,
Smith Coll., Northampton, MA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W79-01744

MICROFLORAL RESPONSE TO AQUATIC WEED DECOMPOSITION,
Massachussets Univ., Waltham. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W79-01746

PATTERN RECOGNITION TECHNIQUES APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
For primary bibliographic entry see Field 5A.
W79-01747

A PROBABILITY MODEL FOR MATCHING SUSPECTS WITH SPILLS - OR DID THE REAL SPILLER GET AWAY.,
Connecticut Univ., Storrs. Dept. of Statistics.
For primary bibliographic entry see Field 5A.
W79-01748

ARSENIC POLLUTION FROM UNDERDRAINAGE AND RUNOFF FROM GOLF GREENS,
Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences.
For primary bibliographic entry see Field 5B.
W79-01752

HOW TO CONDUCT A WASTEWATER SURVEY: PART II - DEVELOPING WASTE STREAM PROFILES,
Burns and Roe Industrial Services Corp., Paramus, NJ.
A. S. Vernick.
Plant Engineering, Vol. 31, No. 16, p 77-80, August, 1977. 1 fig, 2 tab.

Descriptors: *Surveys, *Industrial wastes, *Water utilization, *Sampling, *On-site data collections, Management, Alternate planning, Treatment facilities, Waste water treatment, Pollutant identification.

Procedures for developing individual waste stream profiles as part of a waste water survey are presented. Flow characteristics and pollutant loading are cited as the two major components of waste stream profiles. Water budget analysis is suggested to evaluate a plant's water usage and to reveal trends, seasonal variations, and other information about the plant's water needs. A typical plant water balance for average water consumption and waste water flow in various phases of operation is presented. Various methods for field measurement of water flow are described and compared. A flow diagram for processes related to a survey of water and waste water utilization is presented. Various methods to determine the composition of pollutants as a part of a waste stream profile are discussed. Three types of field sampling, including grab sampling, simple composite sampling and flow-proportioned sampling, and the operation of automatic sampling devices are examined. Analytical aspecsts of a sampling program are discussed, including preparation, preservation, and integrity of samples as well as the use of an independent laboratory to verify company lab results. The definition of waste stream profiles is recommended for evaluations of alternative treatment processes and for the development of an effective waste water management program. (See also W77-12465) (Schulz-FIRL)
W79-01760

REFINERY CYANIDES: A REGULATORY DILEMMA,
Air Products and Chemicals, Inc., Allentown, PA.
For primary bibliographic entry see Field 5D.
W79-01763

DETERMINATION OF POLYCHLORINATED BIPHENYLS IN PAPER MILL EFFLUENTS - THE INFLUENCE OF SUSPENDED SOLIDS,
Institute of Paper Chemistry, Appleton, WI.
For primary bibliographic entry see Field 5A.
W79-01771

EFFECT OF SOIL MIXTURES AND IRRIGATION METHODS ON LEACHING OF N IN GOLF GREENS,
Delaware Univ., Newark. Dept. of Plant Science.
For primary bibliographic entry see Field 5B.
W79-01777

THE EVOLUTION OF TANNERY EFFLUENT TREATMENT--GUIDELINES FOR FURTHER INVESTIGATIONS,
For primary bibliographic entry see Field 5D.
W79-01780

IMPACT OF OFFSHORE OIL AND GAS DEVELOPMENT ON THE COASTAL ZONE: REFORMING THE IMPACT ASSESSMENT PROCESS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Resources.
For primary bibliographic entry see Field 6G.
W79-01783

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 1, BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Programs.
For primary bibliographic entry see Field 5C.
W79-01811

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 2. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continenta Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01818

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL. 3. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administrations, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01822

WABASH RIVER BASIN COMPREHENSIVE STUDY. VOL I. MAIN REPORT,
For primary bibliographic entry see Field 6B.
W79-01830

SHORT-TERM VARIATION OF THE CHEMICAL COMPOSITION OF THE NIAGARA RIVER,
Department of the Environmental, Burlington (Ontario). Water Quality Div.
For primary bibliographic entry see Field 5A.
W79-01831

REPORT OF WASTE SOURCE INVENTORY AND EVALUATION, DADE COUNTY, FLORIDA.
Environmental Protection Agency, Athens, GA. Southeast Water Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 161, Price codes: A07 in paper copy, A01 in microfiche. June 1971, 119 p, 5 tab, 3 fig, 11 append.

Descriptors: *Water pollution, *Waste water treatment, *Waste water(Pollution), *Water quality, *Biological oxygen demand, *Effluent, *Industrial wastes, Suspended solids, Chlorination, Sewage, Phosphorus, Coliforms, Surveys, Carbon, *Dade County(FL), *Atlantic Ocean, Flow meters, Removal efficiency, Average flow.

This is a report of a survey of 76 major and minor municipal wastewater treatment plants in Dade County, Florida, undertaken between November 1970 and February 1972 to judge their treatment efficiency, adequacy of bacterial disinfection, and effluent loading. Twenty-four-hour composite samples were collected from influent and effluent using automatic samplers. Laboratory analyses were conducted on influent and effluent for 5-day BOD, COD, total suspended solids, volatile suspended solids, total organic carbon, and settleable solids. Effluent samples were analyzed for nitrogen compounds, total phosphorus and chlorides. Daily grab samples of the effluent after chlorination were analyzed for chlorine residual, pH and total coliform bacteria. Temperature, chlorine residual and flow were determined in the field. Also included is an industrial waste inventory which locates and identifies significant industrial waste resources. Summary tables are presented showing average flow, population served, removal efficiency, type of treatment, destination of effluents, and remarks concerning each municipal WWT plant. For each industrial pollution source identified, the type of pollution problem, and status of the company's actions to rectify the problem, are reported. It was found that Dade County waters are being contaminated by municipal and industrial wastes and that 21% of municipal waste volume receives inadequate treatment, while 77% receives no treatment. A major recommendation is that a regional collection and treatment system to serve all waste sources in Dade County be in operation to ensure secondary treatment of all wastes, with removal efficiencies of not less than 90%, and with discharge of treated effluents to the Atlantic Ocean. (Coan-NC)
W79-01834

REPORT ON THE QUALITY OF THE WATER OF THE JAMES RIVER, SOUTH DAKOTA, 1970.
Environmental Protection Agency, Denver, CO. Technical Support Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 255, Price codes: A05 in paper copy, A01 in microfiche. Report SA/TA-10, November 1972, 78 p, 10 fig, 33 tab, 2 append.

Descriptors: *Water quality, *Water pollution, *Runoff, *Stream pollution, *Pollution(Water), Turbidity, Suspended solids, Phosphorus, Biological oxygen demand, Dissolved oxygen, Pesticides, Coliform, Rivers, Alkalinity, *South Dakota, *James River(SD), *Feedlots, Fish life propagation, *Survey data, *Dissolved gases.

The study reported in this document was undertaken to determine the pollutional contributions of the Sand Lake Migratory Waterfowl Refuge and the effect of agricultural practices on the water quality of the James River in South Dakota. The field study was divided into two phases, a spring or runoff study, and a summer or low flow study, both undertaken in 1970. The James River originates near Fessendon, ND and travels south about 710 miles to the Missouri River east of Yankton, SD. The greatest flow in the James usually occurs in March and April when snowmelt is greatest. Peak discharges are also experienced from May through June because of heavy rainfall. Annual low flows occur in late summer, autumn, and winter. The field laboratories conducting the study were located near the sewage treatment pumping station in Huron. The samples collected were 'grab' type and were taken at staggered times throughout the day. Samplers made field determinations for dissolved oxygen, temperature and pH, and collected water samples for other laboratory investigations. The laboratory determinations included 5-day BOD, dissolved oxygen, pH, conductivity, turbidity, suspended solids, alkalinity, and coliform, among others. Pesticide samples were also collected. The results of all bacteriological, chemical, and physical determinations are tabulated in the appendix. The contributions of the Sand Lake Migratory Waterfowl Refuge and agricultural practices to water quality could not be adequately assessed due to unfavorable stream and weather conditions. However, it was found that runoff from feedlots caused a significant decrease in the amount of dissolved oxygen and that BOD concentration also increased quite drastically as a result of feedlot runoff. The problems were exacerbated during low-flow periods. (Coan-NC)
W79-01837

OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN. REGION VIII. COLORADO, MONTANA, NORTH DAKOTA, SOUTH DAKOTA, UTAH, WYOMING.
Environmental Protection Agency, Denver, CO. Region VIII.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 280, Price code: A07 in paper copy, A01 in microfiche. November 1971, 132 p.

Descriptors: *Water pollution control, *Oil spills, *Water pollution sources, *Oil pollution, Hazards, Accidents, Fish, Federal government, State government, Local government, Colorado, Montana, Wyoming, North Dakota, South Dakota, Utah, *Contingency planning, Hazardous spills, Oil pollution removal, Regional planning, Personnel, Public administration.

This report is a compilation of agencies and organizations, both federal and state, responsible for coordinating reactions to an oil spill or spills of other hazardous substances occurring in the navigable waters of Region VIII. The regional contingency plan of Region VIII follows the general format of the national contingency plan. In the event of an oil spill or large fish kill, the EPA is notified and takes the necessary first steps. A Regional Spill Emergency Team is formed; its functions are to investigate the spill and report possible federal statute violations, provide needed resources, conduct ecological surveys and investigations, coordinate personnel from other agencies and notify all affected jurisdictions. The geographic boundary of Region VIII is described, along with major navigable waters. Informational data are listed for all government agencies and private firms involved when spills of hazardous substances occur. (Coan-NC)
W79-01842

ENVIRONMENTAL ASSESSMENT OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, DC.
January 1977, 112 p. 68-01-3195.

Descriptors: *Water quality management, *Air pollution, *Environmental effects, *Land use, *Economic impact, *Social impact, *Planning, Data collection, Employment, Runoff, Water supply, PL92-500, *Regional impact assessment, *Ecological impact, *Impact assessment, 208 areawide plans, Critical land areas.

This report is designed to assist managers and staff of planning agencies in assessing the natural and man-made environmental impacts of their recommendations for alternative water quality management (WQM) plan elements. The function of these plan elements is to improve the physical environment in accordance with minimum levels of waste treatment technology as required by PL92-500. This handbook focuses on key assessment questions in the areas of water quality and quantity, land use, air quality, ecological quality, economics, visual quality, and other social impacts. Impacts, impact measurements and data needs are presented, and important questions arising from an impact assessment study are discussed. Each step of the process, from identifying problems in meeting water quality goals, to the selection of an areawide plan, is tied to assessing its impact on the environment. The

handbook sets out several steps when marking an environmental assessment and shows the relationship of the environmental assessment process to the planning process. The environmental assessment steps include identifying community goals and objectives relating to environmental considerations; assessment of possible environmental effects and collection of data; a detailed environmental assessment of alternative plans; development of possible mitigration measures and soliciting public involvement to determine the significance of environmental effects in relation to community goals and objectives; decisions on environmental impacts; and finally, at the time of the areawide WQM plan is selected, documentation of the assessment. (Coan-NC)
W79-01844

COMPREHENSIVE WATER QUALITY MANAGEMENT FOR THE STATE OF SOUTH DAKOTA. 303(E) BASIN PLAN FOR THE MINNESOTA RIVER BASIN.
South Dakota Dept. of Environmental Protection, Pierre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 417, Price codes: A08 in paper copy, A01 in microfiche. 1976, 161 p, 25 tab, 4 graph, 2 fig, 7 append.

Descriptors: *Water quality management(Applied), Water quality, *Planning, *Water pollution, *Water pollution control, Regulation, Water quality standards, Effluent, Discharge, Wastes, Organic wastes, Dissolved solids, Suspended solids, Non-point source pollution, *South Dakota, *Minnesota River Basin, 303(e) Basin Plans, Regional planning, Turbidity.

This report presents South Dakota's strategy for correcting water pollution, thereby improving and maintaining water quality in the Minnesota River Basin. The Basin drains approximately 1,572 square miles in portions of six counties. There are currently three active Water Quality Monitoring (WQM) stations in the Basin. The Basin has generally high quality water but downward sloping topography with resulting erosion is causing some sedimentation and eutrophication problems. The proposed Whetstone River Diversion Project should help reduce these problems. The report inventories point source discharge resulting from municipal, industrial, and agricultural sources and includes tables describing the receiving waters, effluent limitations, type of treatment, and their compliance with water quality standards. The contributors to non-point source pollution are streamside grazing, overgrazing, and natural soil erosion which add organic and inorganic loadings to the waterways. Urban non-point source pollution is not a problem. Several types of monitoring and surveillance activities are conducted annually in the Basin, including operation and maintenance inspections of wastewater treatment (WWT) facilities, compliance monitoring, and inspections of problem feedlots. The main strategies for improving water quality in the Basin consist of erosion control measures, increased cooperation between relevant governmental agencies, increased research and control of non-point source pollution, establishing more WQM stations, and lowering the maximum suspended solids criterion to a maximum of 70 mg/l. (Coan-NC)
W79-01846

INNOVATIVE MANAGEMENT CONCEPT FOR 208 PLANNING,
Michigan Univ., Ann Arbor. Civil Engineering and Natural Resources.
J. W. Bulkley, and T. A. Gross.
Journal of the Water Resources Planning and Management Division (ASCE), Vol. 103, p 227-239, November 1977. 4 fig, 16 ref.

Descriptors: Water resources, *Planning, *Management(Administrative), *Water law, Water use, Water quality, Economics, Legislation, Water, *Thames Water Authority, *208 Planning, *Regional water resource planning, Management reorganization, Financial sources, State laws, Federal laws, Efficiency.

This article addresses the organizational problems arising from the implementation of 208 area-wide water quality planning programs. Criteria have been developed to provide a basis for evaluation of the organizational arrangements by which water services are provided in complex urban areas. These criteria are: the organizational arrangements should include the means for resolving conflicts among all users of water in the region; efficient use should be made of all resources in the provision of water services; financial sources should be adequate and flexible; river basins should be recognized as the units most appropriate to the management of water resources; agencies should be free to employ a wide range of techniques in accomplishing their goals; agencies should be accountable to the entire population served and responsive to its needs and desires; the organizational arrangements for water services should be compatible with the overall government structure; costs and benefits should be distributed equitably throughout the whole region. A short discussion and rationale is provided for each criterion. The Thames Water Authority management structure was described as a possible model for reorganization of U.S. water resource planning. This Water Authority incorporated many previously autonomous water functions under one organizational structure. Decisions were obtained more rapidly, tighter control over the planning process was realized, the reorganization provided the opportunity of all divisions to draw upon the resources of the Authority as a whole, and other benefits were realized. The report concludes with recommendations on how to develop alternative water resource management schemes. (Coan-NC)
W79-01848

ADSORBENT PROCESS FOR OILY MATERIALS,
Daicel Ltd., Sakai (Japan). (Assignee).
A. Zenno, T. Uebayashi, I. Maruyama, and H. Shiono.
U.S. Patent No. 4,102,783, 11 p, 13 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1614, July 25, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality ontrol, Adsorption, Floating, Separation techniques, Cotton, Fibers(Plant).

An adsorbent used for effectively collecting or removing oily materials floating on water or emulsified or dispersed in water is composed mainly for unrefined lints or unrefined linters together with, if necessary, filter papers, synthetic fibers or natural fibers. These materials are mainly formed into a mat, a strand, etc, or can be used in the form of a fixed bed or a fluidized state. The lints are the long fibers recovered first from cotton seed using a cotton gin and are formed into spun yarns and fabrics in a fibrous state using a cotton system spinning machine. However, the cotton seed from which the lints have been recovered further contains short fibers which can also be recovered and they are called linters. (Sinha - OEIS)
W79-01864

APPARATUSES TO SEPARATE MIXTURES OF LIQUIDS OF DIFFERENT SPECIFIC GRAVITIES,
Machinefarbiek Geurtsen Deventer, NV. (Netherlands). (Assignee).
A. A. Geurtsen.
U.S. Patent No. 4,102,787, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1615-1616, July 25, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, *Water quality control, Separation techniques, Specific Gravity, Ballast water, Gravity separation.

An apparatus to separate a mixture of liquids of different specific gravities, e.g. oil and water, comprises a closed vessel containing a separation space, an upper chamber situated above the separation space, a partition mounted for vertical movement between a lowest and a highest position to control regulating and/or signalling device. The partition separates the upper part of the separation space from the upper chamber. The vertically movable partition provided between the separation space and the upper chamber is a diaphragm or a bellows which is attached to the wall of the vessel in a liquid tight manner. A collecting chamber for the heavier liquid is situated under the separation space and is provided with a discharge conduit. (Sinha-OEIS)
W79-01865

HYDRO-CARPET OIL SPILLAGE CONTAINMENT AND RECOVERY DEVICE,
Amerada Hess Corp., Woodbridge, NJ. (Assignee).
R. W. Young.
U.S. Patent No. 4,102,789, 5 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1616, July 25, 1978.

Descriptors: *Patents, *Water pollution control, *Water quality control, *Oil spills, *Oil pollution, Barriers, Obstruction to flow, Equipment, Absorption.

A hydro-carpet apparatus is primarily for providing an emergency containment potential for small oil spills. These spills may result from transferring petroleum products either from a land based supply on shore to a vessel or vice versa. The invention is so arranged that its components can be positioned and placed in a usable state by a single workman without the assistance of additional personnel or by the use of any mechanical equipment. The invention comprises a wheeled container which is placed downstream at the edge of a dock or bulkhead from the point at which the transfer is to take place. The arrangement is so conceived that in the event of a spill a messenger line is pulled smartly, thus tripping the container door and, from this, making it possible to release a carpet roll previously stored in the container so that it can be almost instantly pulled out of the container in such fashion that is balls to the water surface after being unreeled. The carpet contained within the container is formed of surbent material which will temporarily contact and contain, as well as either adsorb, or absorb oil products. (Sinha-OEIS)
W79-01866

METHOD AND APPARATUS FOR PURIFICATION OF WATER,
Ebara Infilco Kabushkik Kaisha, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W79-01886

TREATMENT OF AQUEOUS SYSTEMS,
CIBA GEIGY Ltd., London (England). (Assignee).
For primary bibliographic entry see Field 8G.
W79-01887

OIL SPILL RETRIEVAL SYSTEM,
J. J. Janson.
U.S. Patent No. 4,105,554, 7 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 973, No 2, p 738, August 8, 1978.

Descriptors: *Patents, *Oil spills, *Oil pollution, *Water pollution treatment, Water quality control, Separation techniques, Boats, Monitoring, *Oil recovery.

The invention provides an oil spill retrieval system including apparatus for collecting the oil from the surface of a body of water and for processing the collected oil to remove the water collected with it and to return the cleaned water back to its source. The system includes a boat which carries the collecting and processing apparatus. The significant feature is not processing to provide clean oil but rather processing the mixture so that the removed oil has a minimum of water content to reduce the volume required to be stored until the boat can unload. The other significant feature is to process the removed water until its contaminant level

(with oil) is low enough to permit its discharge back to its source. (Sinha-OEIS)
W79-01889

NITROGEN LOSSES FROM SPRINKLER-APPLIED NITROGEN FERTILIZER,
Nebraska Univ., North Platte. Dept. of Agronomy.
For primary bibliographic entry see Field 3F.
W79-01893

ARSENIC LEVELS IN THE SURFACE AND GROUND WATERS ALONG WHITEWOOD CREEK, BELLE FOURCHE RIVER, AND A PORTION OF THE CHEYENNE RIVER, SOUTH DAKOTA,
Geological Survey, Vermillion, SD.
For primary bibliographic entry see Field 5A.
W79-01897

AN ECONOMIC AND ENVIRONMENTAL EVALUATION OF ALTERNATIVE LAND DEVELOPMENT AROUND NEW HAMPSHIRE LAKES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
R. A. Andrews, and J. A. Pickering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 375, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center, University of New Hampshire Research Report No. 17, 1978. 46 p, 5 fig, 10 tab, 32 ref, 3 append. OWRT A-038-NH(2).

Descriptors: *Economic impact, *Environment, *Organic loading, *Water quality, *Phosphorus, Evaluation, Mathematical models, Linear programming, Lakes, Lake shores, Recreation, Land development, Economics, *New Hampshire, Alternative land development, Phosphorus loading, Commercial developments, Residential developments.

The overall objective was to evaluate alternative land developments around New Hampshire lakes. The analytical method used was based on a combination of a mathematical programming model and a phosphorus nutrient budget model. Alternative development patterns, evaluated by their impacts on the lake area environment and area economy, included residential patterns, commercial patterns, and combinations of these two types. Economic impact from each alternative development was measured in terms of net public revenue and total private expenditures to the local area, to the State and to other states. The impact of the alternative developments on the lake area environment was measured in terms of crowding levels and the level of phosphorus concentration in the lake. Phosphorus loading of the lake water was used as a proxy variable to reflect the changes in the lake water quality. Commercial developments yielded the highest revenues to the town and local areas. It also attracted the most lake users to the area as well as contributing the largest phosphorus loading in the lake waters. Residential developments, although contributing high total revenues to the area, yielded less net revenue to the town. Phosphorus loading levels from residential developments were much lower than lake phosphorus loading by commercial developments.
W79-01904

COMPUTER MODEL FOR PREDICTING POLLUTION IN THE MISSOURI,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-01905

OCCURRENCE OF IRON BACTERIA IN GROUND WATER SUPPLIES OF ALABAMA,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W79-01908

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Coll. of Engineering.
J. D. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 807, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, May, 1977. 78 p, 8 fig, 12 tab, 22 ref, 7 append. OWRT B-008-LA(1). 14-31-0001-5078.

Descriptors: *Eutrophication, *Lake restoration, *Nutrient inactivation, *Sediment sealing, *Farm ponds, *Water quality, Nutrient cycling, Clay soils, Aquatic ecology, Lakes, Reservoirs, Impoundments, Nutrients, Pollutants.

The objective was to determine if the application of clay soils to nutrient-rich pond water would be effective in reclaiming the usefulness of eutrophic farm ponds. Clay particles were to serve as a nutrient inactivant and bottom sediment sealant. Pond water was isolated (in situ) with polyethylene columns. Three clay soil types were used at three application rates on four sites of 12 columns each within the pond: nine columns for the different treatments and three control columns. Three sites were treated in July and the fourth in February. Water samples were taken from the columns and the pond before and after treatment. Samples were analyzed for various water quality parameters to determine the effectiveness of each treatment. Results indicated that under the experimental conditions of this study, application of clay soil within columns in the summer did not effectively reduce productivity or limit nutrient availability. Visual observations of pond productivity indicated that the winter treatment was more effective. It is suggested that clay not be eliminated from consideration as a nutrient inactivant, but further study should be initiated to determine the effects of season of treatment.
W79-01988

MATHEMATICAL MODELS OF DISSOLVED OXYGEN CONCENTRATION IN FRESH WATER,
Stevens Inst. of Tech. Hoboken, NJ.
For primary bibliographic entry see Field 5C.
W79-01998

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SEQUENCING COMPETITIVE EXPANSION PROJECTS,
California Univ., Los Angeles. Graduate School of Management.
D. Erlenkotter, and J. S. Rogers.
Operations Research, Vol. 25, No. 6, Nov.-Dec., 1977, p. 937-951. 1 fig, 21 ref. (California Water Resources Center Project UCAL-WRC-W-474). OWRT B-170-CAL(6).

Descriptors: *Model studies, *Mathematical studies, Economics, *Mathematical models, *Optimization, *Investment, Planning.

A solution approach is developed for finding the sequencing of a finite set of capacity expansion projects that minimizes total discounted operating and investment costs. Variable operating costs are specified through a general continuous-time function that requires projects to be competitive in a certain sense. This definition for operating costs allows the use of an optimization submodel, such as a multilocation distribution problem, to determine operating decisions. The general formulation includes several simple sequencing problems as special cases. The solution approach afdresses a relaxed problem formulation that incorporates economic criteria for determining project timing decisions, and it is shown that properly defined solution to the relaxed formulation solved the original problem. Several refinements to the basic solution approach are also developed. (Snyder-Calif, Davis)
W79-01561

INVESTMENT PLANNING FOR COLORADO RIVER SALINITY CONTROL,
California Univ., Los Angeles. Graduate School of Management; and California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 5G.
W79-01587

ON OPTIMAL REGULATION POLICIES FOR CERTAIN MULTI-RESERVOIR SYSTEMS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W79-01731

MODEL AIDS MANAGERIAL EFFECTIVENESS IN MUNICIPAL WATER SYSTEMS,
Mississippi Water Resources Research Inst., Oxford.
For primary bibliographic entry see Field 5G.
W79-01741

THE IMPACT OF ENERGY SHORTAGE AND COST ON IRRIGATION FOR THE HIGH PLAINS AND TRANS PECOS REGIONS OF TEXAS,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 3F.
W79-01894

6B. Evaluation Process

MANAGEMENT OF LOCAL WATER SYSTEMS IN ALABAMA,
Alabama Univ. in Birmingham. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W79-01536

MONTANA'S WATER RESOURCES: A RESEARCH TRUST.
For primary bibliographic entry see Field 6E.
W79-01541

ENERGY RESOURCES DEVELOPMENT IN WYOMING'S POWDER RIVER BASIN: AN ASSESSMENT OF POTENTIAL SOCIAL AND ECONOMIC IMPACTS,
Wyoming Univ., Laramie. Water Resources Research Inst.
R. A. Matson, and J. B. Studer.
Prepared for Northern Great Plains Resources Program by the Wyoming Water Resources Research Institute in cooperation with the Economic Research Service, U.S.D.A., May 1974. xviii + 152 p, 2 fig, 65 tab, 10 ref, 4 append.

Descriptors: *Wyoming, *Population growth, *Economic impact, *Social impact, *Employment, Distribution patterns, Manpower, Industrial production, *Energy development, *Powder River Basin(Wyo), Campbell County(Wyo), Crook County(Wyo), Niobrara County(Wyo), Converse County(Wyo), Johnson County(Wyo), Sheridan County(Wyo), Natrona County(Wyo), Weston County(Wyo).

Development of the coal and uranium reserves of Wyoming's Powder River Basin, which includes 8 counties in the northeast corner of the state, will generate within a decade sharp increases in employment and population, much of it through the in-migration of relatively young, highly paid workers. Projections of population, employment, and settlement patterns to the year 2000 are made, based on four possible scenarios. Three of these (minimal, intermediate, and extensive coal development) were established by the Northern Great Plains Resources Program (NGPRP); the fourth was developed to accommodate Wyoming's Department of Economic Planning and Development data. Included are a survey of existing literature

and current research, development alternatives, impact estimates, implications of each scenario, and a consideration of the need for further research.
W79-01545

SEQUENCING COMPETITIVE EXPANSION PROJECTS,
California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 6A.
W79-01561

THE STUDY OF ENVIRONMENTAL PUBLIC POLICY: A PRELIMINARY DIRECTORY,
California Univ., Davis. Dept. of Political Science.
G. Wandesforde-Smith.
Human Ecology, Vol. 2, No. 1, 1974, p 45-62. 38 ref. (Univ. of Calif. Water Resources Center Project UCAL-WRC-W337). OWRT B-142-CAL(1).

Descriptors: *Environment, Benefits, Water policy, *Directories(Personnel), Public policy.

Selected contributions to the study of environmental public policy are reviewed in the context of the difficulties faced in making such studies cumulative. The information obtained for a preliminary directory of students of environmental public policy is outlined and briefly analyzed. The directory itself is presented. (Snyder-Calif, Davis)
W79-01569

SUMMER DISTRIBUTION AND REPRODUCTIVE STATUS OF FISH OF THE COLORADO RIVER IN GRAND CANYON NATIONAL PARK AND VICINITY, 1975,
Northern Arizona Univ., Flagstaff. Dept. of Biological Sciences.
C. O. Minckley, and D. W. Blinn.
Final Report No. CRRP-14, June 1976. 17 p, 2 fig, 3 tab, 18 ref. CX821060008.

Descriptors: *Fish populations, *Fish reproduction, *Conservation, *Colorado River, National Parks, Aquatic life, Surveys, Fish types, Ecology, Fish conservation, Bonytail chub, Habitats.

A survey was conducted during the summer of 1975 on the summer distribution and reproductive status of fish in the Colorado River and its tributaries. Ten species were collected, four native and six exotic, and reproduction was verified in all native fish and three exotic species by collection of juvenile forms born that year. All the native fish except the bonytail chub were common varieties and were more abundant in total numbers and localities collected than exotic varieties. However, exotic fish were distributed throughout the system. Although competitive interaction between native and exotic fish generally results in the eventual extirpation of native fauna or a drastic reduction in numbers, it appears that most species of native fish in this area are holding their own and are at levels similar to those of 1968. All fish were examined for ectoparasites and found to be negative. Recommendations are included pertaining to further research and providing information to visitors on endangered species present in the Grand Canyon National Park. (Majtenyi-IPA)
W79-01585

WETLANDS OF THE UNITED STATES: THEIR EXTENT AND THEIR VALUE TO WATERFOWL AND OTHER WILDLIFE,
Fish and Wildlife Service, Washington, DC. Div. of Ecological Services.
S. P. Shaw, and C. G. Fredine.
Available from the National Technical Information Service, Springfield VA 22161 as PB-273 103, Price codes: A05 in paper copy, A01 in microfiche. Circular 39. 1956. 47 p, 12 fig, 8 tab, 18 ref, 20 plates.

Descriptors: *Wetlands, *Classification, *Marsh management, *Wildlife habitat, Marshes, Swamps, *Waterfowl, Conservation, Land use, Aquatic habitats, Census, Survey, Evaluation, National Wetland Inventory.

This report describes the use of the marshes, swamps, and overflow lands by wildlife, and points out relative values of different types of wetlands to wild game in general an to waterfowl in particular. It locates and describes areas that should be protected and improved to meet the needs of a stable or increasing water fowl population. The information is presented to help stimulate the establishment of more comprehensive land-use programs and policies. (Steiner-Mass)
W79-01635

ELITE ATTITUDES TOWARD MARSHLANDS IN SOUTH CAROLINA,
South Carolina Sea Grant Program, Charleston.
E. O. Kline, F. Petrusak, and W. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 208, Price codes: A03 in paper copy, A01 in microfiche. South Carolina Sea Grant Technical Report No. SC-SG-77-5, May, 1977. 29 p, 16 tab, 1 append.

Descriptors: *Marshes, *South Carolina, *Attitudes, Wetlands, Surveys, Land use, Swamps, Atlantic Coastal Plain, Decision making.

Survey research conducted in late 1973 and early 1974 was used to ascertain the attitudes of the elite of South Carolina's coastal counties towards marshlands. Included in the 'elite' are politicians, interest group leaders, and other residents involved and interested in the use of the marsh. Elites were knowledgeable about the marshland and were aware of key marsh-related issues. Development and use of marshland should be regulated by the government according to respondents; forty-five percent believe that the government should directly own and control the marshland. Zoning and leasing permits, two instruments of government regulation, were strongly supported. Fifty-five percent of the elite rated conservation and aesthetic use of marshes at first or second priorities for the future; commercial use was given a much lower priority. Among all of the problems confronting the state, however, respondents do not believe preservation and controlled development of the marsh are among the most important. (Stihler-Mass)
W79-01648

LOUISIANA METROPOLITAN WETLANDS: A PLANNING PERSPECTIVE, A REPORT TO THE LOUISIANA STATE PLANNING OFFICE,
New Orleans Univ., LA. Urban Studies Inst.
A. J. Mumphrey, Jr., E. J. Durabb, W. B. McCrocklin, Jr., S. T. Halperia, and S. D. Villavaso.
October, 1975. 232 p.

Descriptors: *Wetlands, *Land use, *Louisiana, *Cities, *Marsh management, Decision-making, Social aspects, Urbanization, Zoning, Developed waters, Land development, Water pollution effects, Economics, Metropolitan wetlands, Wetland development.

Information is gathered from various sources concerning wetlands and their relationships to metropolitan areas and a decision-making framework is presented for wetland development. In chapter one, wetlands are defined and a general description of Louisiana's wetland Standard Metropolitan Statistical Areas (SMSA) are given. The second chapter examines wetland zoning and master land use plan projected wetland development for each SMSA. Chapter three focuses on the impacts of metropolitan development in wetlands in terms of pollution, reclamation, and channelization. A per acre monetary evaluation on the basis of non-competing wetland component functions and wetland energetics is given in chapter four. Private and public construction and maintenance costs in wetland areas are considered in chapter five. Projections of future metropolitan land space requirement and location of activities are discussed in chapter six. Chapter seven discusses impacts in a framework of development decision making which includes comprehensive costs and benefits, community goals, and distribution effects. Chapter eight presents a comprehensive planning process leading to wetland development or nondevelopment and also points out areas of future research. (Steiner-Mass)
W79-01650

DECISION MAKING IN A MULTIPLE-USE APPROACH TO THE RECLAMATION OF STRIP-MINED LANDS,
Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering; Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 5G.
W79-01730

ON OPTIMAL REGULATION POLICIES FOR CERTAIN MULTI-RESERVOIR SYSTEMS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W79-01731

WATER SUPPLIES AND COSTS IN RELATION TO FARM RESOURCE DECISIONS AND PROFITS ON SACRAMENTO VALLEY FARMS,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W79-01737

CONSUMER ATTITUDES TOWARD TASTE AND ODOR IN WATER,
California Univ., Berkeley. School of Public Health.
W. H. Bruvold.
Journal American Water Works Association, October 1977, p 562-564. (California Water Resources Center Project UCAL-WRC-W-359).

Descriptors: *Water quality, *Taste, *Odor, *Attitudes, Social values, Social perception, Consumer attitudes.

The rationales behind several approaches to investigating consumer perception of taste and odor in water are explored. The analysis suggests that two of four categories of taste and odor would be governed best by limits and two would best be governed by grades - the major determinant being the pleasantness or desirability of just perceptible concentrations. Consumer-panel research would produce better limits as standards. Both types of research need further development and refinement before a full range of perceptual standards can be recommended with confidence. Enough progress has been made in consumer and in threshold research to encourage further work on both toward attaining the best possible perceptual water quality for all consumers. (Snyder-Calif, Davis)
W79-01739

HOW TO CONDUCT A WASTEWATER SURVEY: PART II - DEVELOPING WASTE STREAM PROFILES,
Burns and Roe Industrial Services Corp., Paramus, NJ.
For primary bibliographic entry see Field 5G.
W79-01760

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL, AND CLIFTY CREEK AND PATOKA RIVER, IN, VOL. I: REPORT.
Army Engineer District, Louisville, KY.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 531, Price codes: A06 in paper copy, A01 in microfiche. 1964, 91 p, 15 tab, 7 plates. See also Vols. II and III.

Descriptors: *Water resources development, *Multiple-purpose reservoirs, *Water resources, *Comprehensive planning, *Reservoirs, Illinois, Indiana, Surface waters, Impoundments, Competing uses, Reservoir storage, Water sources, Water supply, Economics, Projects, Administration, Alternative planning, Area redevelopment, Flood control, Recreation, Water policy, Watersheds(Basins), Cost-benefit analysis, Hydrology, Local governments, Inter-agency cooperation, Fisheries, Water quality, *Wabash River Basin, *River basin development.

This interim report is preliminary to the 71 publication of the Wabash River comprehensive plan, for the Wabash River and tributaries in Indiana, Illinois and Ohio. Studies on the three reservoir pojects recommended in this plan had progressed to the point where their construction had been deemed desirable and this report was prepared as a vehicle for the possible authorization of these projects. The report reviews economic development, meteorology and hydrology, water resources problems and needs, considered solutions, reservoir plans, cost allocations, local cooperation and inter-agency coordination. The report proposes development of Lincoln Reservoir on Embarrass Creek in Illinois, Clifty Creek Reservoir on Indiana's Clifty Creek and Patoka Reservoir on Patoka River in Indiana. Each reservoir is multi-pupose, affording flood control, water-associated recreation and providing new fisheries. Additionally, both Lincoln and Patoka Reservoirs would provide needed storage for water supply and improvement of downstream water quality. For each Project, benefits exceed costs with ratios ranging from 2.2:1 to 1.6:1. The projects have been endorsed by local governments, and public agencies; however, local individuals and interests whose properties are involved in land acquisition or damage consideration generally oppose the projects. (Zayac-NC)
W79-01827

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL, AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. II: APPENDICES A-C.
Army Engineer District, Louisville, KY.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 532, Price codes: A10 in paper copy, A01 in microfiche. January 1964, 207 p. Appendix A: Detailed Estimate of First Costs and Annual Costs; Appendix B: Economic Development and Estimates of Damages and Benefits; Appendix C: Cost Allocation and Apportionment. See also Vols. I and III.

Descriptors: *Water resources development, *Multiple-purpose reservoirs, *Economics, *Cost allocation, *Comprehensive planning, Indiana, Illinois, Amortization, Annual benefits, Cost-benefit analysis, Costs, Cost analysis, Area redevelopment, Employment, Human resources, Labor supply, Recreation, Water quality, Water supply, Regional development, Economic efficiency, Economic impact, Income, Income analysis, Regional economics, Wages, Annual costs, *Economic development, *Cost apportionment, *Wabash River, River basin development.

This volume is part of the interim report published prior to the 1971 publication of the Wabash River comprehensive plan for the Wabash River and tributaries in Indiana, Illinois an Ohio. Three reservoirs are recommended in the interim plan: Lincoln Reservoir on Embarrass Creek, IL; Clifty Creek Reservoir and Patoka Reservoir. IN. Appendix A is comprised of two sections: the first is a detailed estimate of first costs and annual costs; the second reviews Area Redevelopment Act (ARA) effects. The first section is a series of tables, with each of the three projects' costs first summarized, followed by detailed estimates of first costs and annual costs. The second section reviews labor costs; operation and maintenance costs; population; employment and unemployment; and skilled worker effects resulting from the implementation of ARA. Appendix B reviews economic development and estimates of damages and benefits that might result from the construction of the three projects. An economic history of the Wabash River Basin is presented, development differences between the White and Wabash Basins are discussed, population and projected growth and distribution in the Wabash Basin are outlined and development trends reviewed. Appendix C assesses cost allocation and apportionment. The allocation of costs between purposes is explored. Investment costs, annual costs and alternate costs are inventoried. This is followed by the apportionment of costs between federal and non-federal interests in such categories as flood control, water supply, water quality control, fish and wildlife and recreation. (Zayac-NC)
W79-01828

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL., AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. III, APPENDICES D-F.
Army Engineer District, Louisville, KY.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 533, Price codes: A99 in paper copy, A01 in microfiche. January 1964, 641 p, Appendix D: Hydrology and Hydraulics; Appendix E: Geology, Soils and Materials; Appendix F: Reports of Other Agencies. See also Vols. I and II.

Descriptors: *Hydrology, *Hydraulics, *Multiple-purpose reservoirs, *Geology, *Comprehensive planning, *Water resources development, Indiana, Illinois, Geohydrologic units, Hydrologic aspects, Hydrologic budget, Hydrologic cycle, Hydrologic data, Permeability, Drainage, Flood control, Limnology, Precipitation(Atmospheric), Runoff, Spillway gates, Streamflow, Watersheds(Basins), Engineering geology, Geologic foundations, Geomorphology, Topography, Sedimentation, Recreation, *Wabash River, *Embarrass River(IL), River basin development.

This volume is part of the interim report published prior to the 1971 publication of the Wabash River comprehensive plan for the Wabash River and tributaries in Indiana, Illinois and Ohio. Three reservoirs are recommended in the interim plan: Lincoln Reservoir on Embarrass Creek, IL.: Clifty Creek Reservoir and Patoka Reservoir, IN. Appendix D Surveys the hydrology and hydraulics of each site both before and after the expected construction of each project. Included are flow data at the dam sites, unit hydrographs at selected points on the rivers to be impounded, tailwater rating curves, area and capactiy of the reservoirs, standard project storms and floods, plans for water supply and water quality storage, flood control and regulation, engineering reviews of outlet works and spillways, runoff data and frequency curves outlining natural discharge, natural stages and modified stages. Appendix E reviews the geology, soils and materials of each of the three projects. Features of each site are discussed: physiography, regional geology, bedrock structures, groundwater conditions, foundation explorations, and conditions of preliminary and final site selection, embankments and sources of construction materials. Appendix F is comprised of 10 reports from other agencies. Agencies submitting reports are U.S. Dept. of Agriculture Soil Conservation Service and Forest Service; U.S. Dept. of Interior Geological Survey, Fish and Wildlife Service, Bureau of Outdoor Recreation, Bureau of Mines; U.S. Dept. of Health, Education and Welfare Public Health Service; the Federal Power Commission; City of Charleston, IL.; and Indiana Flood Control and Water Resources Commission. These include groundwater appraisals, geological maps, reports on recreation resources and fish and wildlife resources and water resources and water resources study for the various reservoir projects. (Zayac-NC)
W79-01829

WABASH RIVER BASIN COMPREHENSIVE STUDY. VOL I. MAIN REPORT,
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 536, Prepared by U.S. Army Corps of Engineers, Louisville District, for Wabash River Coordinating Committee, (Ill-Ind-Ohio), 1971, 266 p, 97 tab, 128 fig, 2 attachments.

Descriptors: *Water resources development, *Water resources, *Planning, *Comprehensive planning, Illinois, Indiana, Ohio, Water reuse, Water policy, Water quality, Monitoring, Natural resources, Land resources, Water rights, Economic, Regional analysis, Social impact, Environmental impact, Geology, Topography, Physiographic provinces, Climate, Hydrology, Water supply, Navigation, Programs, Flood control, Ground water availability, *Wabash River Basin planning.

The Objective of this study is to identify, evaluate and propose a water and land resource plan for the Wabash River and its tributaries in Indiana, Illinois and Ohio. Four basic planning elements--economic, regional, environmental and social--are addressed in the study in order to accommodate the best balance of interests in a solution to the water problems and needs of the people of the Wabash River Basin. In this main report, physical characteristics of the basin are described, including geology, physiography, topography, land resources, climate, hydrology and environmental features. The economic environment is discussed in terms of current economic patterns and activities and the projected economy. The status of water and related land resources availability, development, programs and planning are assessd. Problems and needs in flood control, water supply, electric power, water quality, environmental resources and navigation are studied. A background to the formulation of the comprehensive plan is provided, followed by a description of the comprehensive plan. Here, the plan is first described in general terms. Then each plan feature and its short- and long-run implications are scrutinized. Lastly, effects for each subbasin are reviewed. A summary evaluation conducted for each problem (or need) outlined above. Implementation is discussed, followed by conclusions and specific recommendations for water quality, ground water use, water reuse and water quality monitoring. Policy and legislative suggestions are provided and recommendations for plan implementation are outlined. (Zayac-NC)
W79-01830

PHYSICAL AND ECONOMIC FEASIBILITY OF NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
For primary bibliographic entry see Field 6F.
W79-01833

INCENTIVES FOR IMPROVED WATER-USE EFFICIENCY: IMPLEMENTATION PHASE,
Abt Associates Inc., Cambridge, MA.
For primary bibliographic entry see Field 3F.
W79-01836

A LAND STUDY FOR DOWNTOWN LAKE CHARLES,
Houston Univ., TX. Coll. of Architecture.
B. C. Webb, D. Herring, and J. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 477, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Lake Charles-McNeese Urban Observatory, Inc., Lake Charles, LA, Spring 1977, 21 p.

Descriptors: *Urban land use, *Architecture, *Urban planning, *Planning, Recreation, Community development, Land development, *Lake Charles(LA), Commercial structures, Public amenities, Infrasture.

This study investigates the factors that will help determine the most appropriate use and development pattern for a section of publicly-owned waterfront property located within the city of Lake Charles, LA. The factors include the morphological features of the city, activity patterns, and an assessment of the city's building process. The report explores the use potential of the site in terms of the related activity patterns in the area as well

as structuring concepts for integrating site development with the existing city fabric and effective use of the attractive site features. The present tract is undeveloped except for a narrow band of landscaping adjacent to the Lake Shore Highway, a major thoroughfare running along the edge of the site. The site is well located in relation to the major activity centers of the central city, with good visibility and access from entry roads, and is located close to a major civic center. The report offers several different uses for the site and evaluates these uses in terms of overall compatibility within the city's context. The three general land use concepts discussed are a waterfront park, uses related to the Civic Center and uses related to the tourist traffic. The major conclusion of the report is that the infrastructure should be built first, followed by the development of the public amenities and facilities, and lastly, the building of commercial structures. The development plan should be flexible enough to provide for changing circumstances. (Coan-NC)
W79-01838

THE UPPER COLUMBIA NAVIGATION PROPOSAL.
Cornell, Howland, Hayes and Merryfield, Bellevue, WA.
For primary bibliographic entry see Field 4A.
W79-01843

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM, 2ND YEAR WORK PRODUCT, VOL. VI. PUBLIC PARTICIPATION ACTIVITIES BY LEAGUE OF WOMEN VOTERS, NORTHEASTERN ILLINOIS PLN. COMMISSION, LAKE MICHIGAN FEDERATION.
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
Sponsored by NOAA, Office of Coastal Zone Management, Washington, D.C., September 1976, 102 p, 3 append.

Descriptors: Water resources, *Coasts, *Illinois, *Management, Planning, Political aspects, *Lake Michigan(IL), *Coastal Zone Management, *Public participation, Resources management.

This report is a compilation of second-year citizen participation activities and their influence on the Illinois Coastal Zone Management Program for Lake Michigan. The three organizations responsible for involving the public in the planning process were: the Lake Michigan Inter-League Group of the League of Women Voters (LWV); the Northeastern Illinois Planning Commission; and the Lake Michigan Federation. Included in the activities sponsored by the League of Women Voters are descriptions of each of the 12 public education and input meetings scheduled by local Leagues, the publicity developed by each of these Leagues, the methodology used at each meeting, and the results of the citizen comments elicited at each meeting. Also included are explanation of the rationale and procedures involved in the distribution of packets of information to area libraries prior to each scheduled meeting. The Northeastern Illinois Planning Commission's function was to facilitate communication between the public and officials in the Coastal Zone Management Program. Their activities included conducting a training session for all public meeting facilitators; preparing three identical library displays keyed to LWV-sponsored public meetings; and providing the staff evaluation and consultation on group interaction methods for effective participation. Descriptions of the Lake Michigan Federation activities included their public workshops on Coastal Zone Management, publishing of a report (Lake Michigan Current), and monitoring staff and citizen attitudes about the Program. Each organization has provided an analysis of the success of their undertakings. (Coan-NC)
W79-01845

COMPREHENSIVE WATER QUALITY MANAGEMENT FOR THE STATE OF SOUTH DAKOTA. 303(E) BASIN PLAN FOR THE MINNESOTA RIVER BASIN.
South Dakota Dept. of Environmental Protection, Pierre.
For primary bibliographic entry see Field 5G.
W79-01846

SYSTEMATIC DEVELOPMENT OF INSTITUTIONAL AND LEGAL PRESCRIPTIONS FOR URBAN WATER USE AND MANAGEMENT,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W79-01891

AN ECONOMIC AND ENVIRONMENTAL EVALUATION OF ALTERNATIVE LAND DEVELOPMENT AROUND NEW HAMPSHIRE LAKES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W79-01904

FACTORS AFFECTING THE USE OF AN ARTIFICIAL BEACH: A CASE STUDY ON MISSISSIPPI GULF COAST,
University of Southern Mississippi, Hattiesburg. School of Business Administrations.
C. P. Cartee, and D. C. Williams, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 393, Price codes: A04 in paper copy, A01 in microfiche. Report, October 1978. 59 p, 2 fig, 16 tab, 16 ref. OWRT A-109-MISS(1). 14-34-0001-8026.

Descriptors: *Beaches, *Recreation standards, *Recreation demand, *Artificial beaches, Harrison County(Miss), *Mississippi, Pass Christian(Miss), Long Beach(Miss), Gulfport(Miss), Biloxi(Miss).

The purpose was to provide basic data relative to the utilization of the 26-mile, man-made beach in Harrison County, Mississippi, and to determine factors related to beach use. More specifically, the project was purposed with quantifying the level of beach usage by delineated zones at selected periods of the year; determining the characteristics of users and factors prohibiting or encouraging their use of the beach; appraising consumer perception of water quality and its relationship to beach usage; and reviewing the various legal, political and jurisdictional factors affecting the future development and use of the resource. Procedures involved random counts of beach usage by delineated zones and personal interviews with beach users. Marked variations were found in beach usage among zones and periods of the year. In terms of carrying capacity criteria the beach was well below its potential. A significant difference was found between resident and non-resident perceptions of beach water quality while no significant difference was found in activity usage of the beach between the two groups. Lack of public conveniences on or contiguous to the beach was noted by the two groups. Lack of public conveniences on or contiguous to the beach was noted by the two groups. Lack of public conveniences on or contiguous to the beach was noted by interviewees most often as factors detracting from their beach recreational experience.
W79-01979

REMOTE SENSING ASSESSMENT OF DAM FLOODING HAZARDS: METHODOLOGY DEVELOPMENT FOR THE NEW YORK STATE DAM SAFETY PROGRAM,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 4A.
W79-01980

AN UNOBTRUSIVE MEASURE OF THE RECREATIONAL VALUE OF A LAKE,
Augusta Coll., GA.
W. D. Spears, and R. R. Criss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 363, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Institute Bulletin 27, Auburn University, Alabama, April 1977. 16 p, 2 fig, 2 tab. OWRT B-037-ALA(2).

Descriptors: *Lakes, *Recreation, Socio-economic value, *Alabama, *Social value, *Social participation, Measurement.

Data from a study of an Alabama lake was used to demonstrate that separate measures of rated values of a facility for various recreational activities, and reports of participation in those activities, are functionally related to a high degree. A simple unobtrusive measure, obtainable by a 'nose count' by an observer or from daily records maintained in some facilities, may provide the equivalent of information regarding one kind of social value usually obtained by unwieldly questionnaires. The measures developed in this study may well overcome a crucial problem present in questionnaire studies: What can be concluded if the percent of respondents is low. This study concluded that percents of participants engaged in various activities can validly indicate perceived worth of the site for those activities. Careful accounting would require original calibration of the percentage measure against a scale of value, but once obtained, non-obtrusive measures would permit monitoring of recreational value of a site as it changed with conditions, expenditures, etc.
W79-01986

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

EFFICIENCY AND EQUITY IN PRICING LOCAL PUBLIC SERVICES: THE CASE OF WASTEWATER,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W79-01544

WATER SUPPLIES AND COSTS IN RELATION TO FARM RESOURCE DECISIONS AND PROFITS ON SACRAMENTO VALLEY FARMS,
California Univ., Davis. Dept. of Agricultural Economics.
T. R. Hedges.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 688, Price codes: A06 in paper copy, A01 in microfiche. Giannini Foundation Research Report No. 322, June, 1977. 90 p, 12 fig, 14 tab, 37 ref, append. (California Water Resources Center Project UCAL-WRC-W-111). OWRT B-008-CAL(3) and B-068-CAL(2).

Descriptors: *Economics, *Water requirements, *Decision making, Management, Groundwater, Water management(Applied), Resource allocations, Model studies, *Crop production, *Tomatoes, *Sacramento Valley(Calif), Irrigation water use, Water supply, *Cost analysis, California.

This summary of research on two 640-acre general-crop farm models in the Southern Sacramento Valleys, Yolo County, examines the economic impacts of variations in water quantities and costs on farm profits. This second study (see also W74-11568) in the Sacramento Valley irrigation economics series considers two analysis models: The high productivity soils unit includes Storie Index Grades I and II soils; the soils for the medium productivity unit are predominantly Storie Index Grade III, but range into Grade IV. Maximum potential water quantities available for the analysis models in this study total nearly 2,800 acre-feet, according to the number of wells and their potential pumping capacity. Water prices were approximately $2.50 to $3.00 per acre-foot, depending on quantities pumped, for variable expenses only, or a total of about $7.00 to $9.00 per acre-foot for variable expenses and fixed costs combined. The study analyzed three general crop irrigation practices: (1) reirrigating when the depletion percentage for available soil moisture reaches 60 percent-'wet'; (2) reirrigating at the 80 percent depletion

level--'medium'; and (3) reirrigating at the 100 percent depletion level--'dry'. Canning tomatoes lead the crops in amount of net returns under all three irrigation practices, with sugar beets and alfalfa hay following in that order. A series of linear programming analyses within the framework of 22 constraints evaluated the potential effects of water quantities, water prices, and tomato prices on total farm net returns. A linear program analysis determined the impact on crop choices and land allocations for these two analysis units as water costs rise from zero price to over $20.00 per acre-foot. These analyses also indicate that farmers on the better soils can profit by expanding water use faster as prices drop, as compared with operators on the medium soil.
W79-01737

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL, AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. II: APPENDICES A-C.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01828

COST REPORT ON NON-STRUCTURAL FLOOD DAMAGE REDUCTION MEASURES FOR RESIDENTIAL BUILDINGS WITHIN THE BALTIMORE DISTRICT,
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 6F.
W79-01832

THE UPPER COLUMBIA NAVIGATION PROPOSAL.
Cornell, Howland, Hayes and Merryfield, Bellevue, WA.
For primary bibliographic entry see Field 4A.
W79-01843

THE IMPACT OF ENERGY SHORTAGE AND COST ON IRRIGATION FOR THE HIGH PLAINS AND TRANS PECOS REGIONS OF TEXAS,
Texas A and M Univ., College Station. Dept. of Agricultural Economics and Rural Sociology.
For primary bibliographic entry see Field 3F.
W79-01894

WATER CONSERVATION IN THE LAS VEGAS VALLEY: PRICING AND ALTERNATIVE MEASURES,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 3D.
W79-01896

6D. Water Demand

WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
For primary bibliographic entry see Field 8C.
W79-01835

WATER CONSERVATION IN THE LAS VEGAS VALLEY: PRICING AND ALTERNATIVE MEASURES,
Nevada Univ. System, Reno. Water Resources Center.
For primary bibliographic entry see Field 3D.
W79-01896

THE ROLES OF WATER CONSERVATION VALUES IN COMMUNITY POLICY,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 3D.
W79-01987

NORTH SLOPE BOROUGH WATER STUDY, A BACKGROUND FOR PLANNING,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W79-01991

6E. Water Law and Institutions

UNITED STATES PARTICIPATION IN THE INTERNATIONAL HYDROLOGICAL PROGRAM 1975-.
National Committee for the International Hydrological Decade, Washington, DC.
For primary bibliographic entry see Field 2A.
W79-01509

SEDIMENT CONTROL CONFERENCE, HELD AT HELENA MONTANA ON DECEMBER 15, 1972.
National Association of Conservation Districts, Washington, DC.
For primary bibliographic entry see Field 4D.
W79-01523

MANAGEMENT OF LOCAL WATER SYSTEMS IN ALABAMA,
Alabama Univ. in Birmingham. Dept. of Political Science.
W. M. Kimmelman, W. J. Duncan, and H. H. Tsang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 222, Price codes: A05 in paper copy, A01 in microfiche. Alabama Water Resources Research Institute Bulletin 34, Auburn University, September 1978. 111 p, 23 tab, 6 fig. OWRT A-050-ALA(1) and B-071-ALA(1).

Descriptors: *Water systems, *Political aspects, Economics, *Management, *Water supply, *Alabama, Water policy, *State water agencies(Alabama).

Part 1 of this report is a study of two public water systems in Calhoun and Cleburne Counties, Alabama. The focus is on major political and economic dimensions that play a key role in the management of water systems in Alabama. The study reveals that the problem of water management is less one of overall supply than the lack of necessary political-economic organizations in getting water from where it is to where it is needed. Part 2, Some Political and Economic Aspects of Water Agencies in Alabama, is an outgrowth of Part 1. While concentrating on local public water systems which provide direct water services, the study also considers how state agencies established to coordinate, regulate and influence water use can facilitate or inhibit the performance of local public water supply systems. (Cooper-Alabama)
W79-01536

MONTANA'S WATER RESOURCES: A RESEARCH TRUST.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 227, Price codes: A03 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Montana State University, Bozeman, Progress Report, March 1978. 34 p. OWRT A-999-MONT(2). 14-34-0001-7055.

Descriptors: *Progress report, *Montana, Research and development, Legal aspects, *Water Resources Institutes.

The Montana University Joint Water Resources Research Center was established by action of the Board of Regents of the Montana University System on December 8, 1964, under the terms of the Water Resources Research Act of 1964 (Public Law 88-379). The 1975-77 programs of the Center provided funding/administration for twenty allotment, three matching grant, two Title II, and three regional cooperative projects. The projects, which deal with such diverse topics as water quality; economics, social, and institutional studies; mining impacts; saline seep; water resources; land use; wastewater treatment; irrigation effects; and soils-water relationships, are described briefly. Research results have contributed to the control of saline seep, maintaining and improving water quality, analysis and discussion of economic and social issues related to coal-water-energy development in the Yellowstone River Basin, and conservation of precipitation (snow). In addition, the Center has worked closely with state and federal agencies, the Pacific Northwest and Missouri River Basin Commissions, and other institutes in the region; sponsored annual research review conferences; and provided financial support for both undergraduate and graduate students at the three participating University System units. A list of 58 available project completion reports is included. (Hoffman-Montana)
W79-01541

SURVEY OF ORDERS OF CONDITIONS (UNDER WETLANDS PROTECTION ACT) OF THE CONSERVATION COMMISSIONS OF CAPE COD, 1973-1977.
Association for the Preservation of Cape Cod, Orleans, MA.
December, 1977. 19 p, 3 tab, 8 ref.

Descriptors: *Wetlands, *Massachusetts, *Legislation, *Regulation, Water law, Legal aspects, Permits, Water permits, Water rights, Public rights, Administrative decisions, Marsh management, *Cape Cod, *Wetland Protection Act(Massachusetts), Orders of Conditions.

Assistance in the implementation of the Massachusetts Wetland Protection Act is provided for the Cape Cod area. Orders of Conditions issued by the 15 Cape towns' conservation commissions have been surveyed in order that the projects involved could be categorized and the disposition of Orders which have been appealed could be followed. In addition, copies of the Coastal and Inland Wetland Acts are provided in the appendix. (Steiner-Mass)
W79-01631

ELITE ATTITUDES TOWARD MARSHLANDS IN SOUTH CAROLINA,
South Carolina Sea Grant Program, Charleston.
For primary bibliographic entry see Field 6B.
W79-01648

INCENTIVES FOR IMPROVED WATER-USE EFFICIENCY: IMPLEMENTATION PHASE,
Abt Associates Inc., Cambridge, MA.
For primary bibliographic entry see Field 3F.
W79-01836

OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN. REGION VIII. COLORADO, MONTANA, NORTH DAKOTA, SOUTH DAKOTA, UTAH, WYOMING.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W79-01842

ILLINOIS COASTAL ZONE MANAGEMENT PROGRAM, 2ND YEAR WORK PRODUCT, VOL. VI. PUBLIC PARTICIPATION ACTIVITIES BY LEAGUE OF WOMEN VOTERS, NORTHEASTERN ILLINOIS PLN. COMMISSION, LAKE MICHIGAN FEDERATION.
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
For primary bibliographic entry see Field 6B.
W79-01845

INNOVATIVE MANAGEMENT CONCEPT FOR 208 PLANNING,
Michigan Univ., Ann Arbor. Civil Engineering and Natural Resources.
For primary bibliographic entry see Field 5G.
W79-01848

Group 6E—Water Law and Institutions

SYSTEMATIC DEVELOPMENT OF INSTITUTIONAL AND LEGAL PRESCRIPTIONS FOR URBAN WATER USE AND MANAGEMENT,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
J. P. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 488, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 81. August 1978. 74 p, 192 ref, 1 append. OWRT B-058-IND(1).

Descriptors: *Legal aspects, *Water law, *Water policy, *City planning, *Legislation, Administration, Common law, Water resources development, Riparian rights, Water resources planning, Water management, Urban regional development, Management, Water allocation, Institutions, *Indiana, Statutes, Urban water resources.

Indiana public policy concerning the development and regulation of water resources is surveyed. Existing case law on water use is scant, and adjudicated controversies deal with disputes between individual parties rather than the formation of broad resource use policies. The judiciary does not have the opportunity to do the planning and management necessary to assure adequate water supplies and water quality control for the state of Indiana. Since the legislative branch bears the primary responsibility for statewide, long range planning, Indiana statuatory law concerning water resource management is closely scrutinized in terms of both breadth and efficacy. The relationships between federal, state, and local government agencies in providing for adequate water resource management are also examined. Common law theories on water resource management are then reviewed in reference to the rights of riparian land owners as opposed to the rights of drainage basin occupants. Traditional common law theories are then applied to considerations relevant to the choice between surface water and ground water as a primary source of supply. Finally, the Highland Reservoir proposal and other specific municipal planning activity is evaluated in reference to data gathered in a 1972 survey of water resources in Indiana.
W79-01891

KARSTIC INSTITUTIONAL CONFLICTS AND OPPORTUNITIES,
Appalachian Regional Commission, Washington, DC. Energy, Environment and Natural Resources Div.
H. B. Montgomery.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 19-31, 1977. 8 fig, 2 tab, 8 ref.

Descriptors: *Karst, *Planning, *Regional development, *Institutions, Subsidence, Appalachian mountain region, Limestones, Research and development, Land use, Research priorities, Governments, Administrative agencies.

The science and engineering of geology can address the problems arising from a growing population's consuming patterns. The consumption can result figuratively in a diminishing world and literally in resource dispersion, which, in effect, is the dilution of high quality natural resources and prime terrain, thereby diminishing their economic availability. The management of growth, known as development, is particularly effective when priorities for investment actions are conceived from multi-program and regional perspectives. When proceeding with reference to the resultant planned overview, a reduction can be achieved in the incidence of adverse conflicts arising from interactions between populations and their environments. If geological wisdom is to provide the maximum help to reducing those conflicts, then geo-specialists must extend themselves beyond their specialty to participate in the decision-making processes socity has designed for institutions to discipline themselves, including the related public participation procedures. Geographic, economic, ecological, environmental, and social impacts from karstic events are part of a broader perception concerning the consequences of undermining the earth's surface. Coal mining, mine roof collapse and surface ground subsidence are comparable to the collapsing of limestone solution cavities. Similarly, many coal mining area communities face post-mining collapse hazards to health, safety, property, general well-being, and quality of life. As national energy needs are satisfied, there will be further threats to community security from mine subsidence events. Experience in addressing current and future community problems caused by coal mine subsidence can assist the development of approaches to resolving unacceptable conditions in karstic terrains. (See also W79-01932) (Humphreys-ISWS)
W79-01935

EARLY CONFLICTS OVER EFFLUENT IRRIGATION IN MISSOURI'S OZARKS,
Missouri Univ., Columbia. School of Forestry, Fisheries and Wildlife.
C. D. Settergren.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 405-410, 1977. 1 fig, 2 ref.

Descriptors: *Waste water disposal, *Water pollution, *Irrigation, *Missouri, Karst, Effluents, Water pollution sources, Groundwater, Jurisdiction, Federal jurisdiction, State jurisdiction, *Missouri Ozarks, Agency conflicts.

Irrigation land disposal of sewage effluent in the Karst Ozarks has been challenged vigorously. There has been a growing concern that the quality of a number of Missouri's spring-fed Ozark streams has become jeopardized by the discharge of wastewater from various sources. In 1973, in an effort to protect selected endangered waterways, Missouri's Clean Water Commission banned all direct discharge. Effluent irrigation was virtually the only state-sanctioned disposal alternative open. Unfortunately for a number of small municipalities and others seeking to comply with the new regulations, the EPA, which must approve all requests for federal planning and construction grants, declared that effluent irrigation is contra-indicated for the Ozarks. The EPA and others contended that the disposal of treated sewage on the karst landscape would endanger the vulnerable groundwater supplies. Others felt that, with the careful selection of an irrigation site and proper system design, effluent renovation could be achieved safely prior to percolation to groundwater. Although early in 1975 the Clean Water Commission provided a way around the dilemma by redefining 'no discharge' to allow for the limited release of secondary treated effluent, there continues to be an information moratorium on effluent irrigation systems in Missouri's Karst Ozarks. (See also W79-01932) (Humphreys-ISWS)
W79-01971

6F. Nonstructural Alternatives

COST REPORT ON NON-STRUCTURAL FLOOD DAMAGE REDUCTION MEASURES FOR RESIDENTIAL BUILDINGS WITHIN THE BALTIMORE DISTRICT,
Army Engineer District, Baltimore, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 013, Price codes: A07 in paper copy, A01 in microfiche. Army Engineer Institute for Water Resources, Fort Belvoir, VA, July 1977, p. 135, 4 append.

Descriptors: *Flood protection, *Floodproofing, *Building codes, *Non-structural alternatives, Construction costs, Relocation, Urban renewal, Planning, Flood damage, Cost estimates, *Baltimore,(MD), *Flood damage reduction, Methodology, Residential buildings.

This report provides cost estimates, structural analysis, and real estate policy guidelines for reducing flood damage via non-structural methods. The 5 non-structural measures include: acquisition and demolition of the existing flood-prone structure; relocation of the flood-prone structure outside the flood plain; relocation of household mechanical and electrical equipment to an area that is not subject to flooding; raising the first floor of a flood-prone structure; and floodproofing the basement against infiltration. Commercial and industrial establishments are outside the intended scope of this report. Cost estimates are for four locations in Baltimore. The report provides an introduction to the purpose and design of the cost analysis of each method, the various assumptions and considerations relating to the evaluation of each measure, the results of the cost analysis for each method and combination of methods, and a general discussion on the applicability of each non-structural measure given a water surface location. This report can be utilized by planners, homeowners, and local officials trying to reduce or eliminate flood damages to residential structures by using nonstructural approaches. (Coan-NC)
W79-01832

PHYSICAL AND ECONOMIC FEASIBILITY OF NONSTRUCTURAL FLOOD PLAIN MANAGEMENT MEASURES,
Hydrologic Engineering Center, Davis, CA.
W. K. Johnson.
Prepared for Army Corps of Engineers, Ft. Belvoir, VA, Institute for Water Resources. March 1978, 95 p, 3 append.

Descriptors: *Flood plain zoning, *Land use, *Planning, *Flood insurance, *Nonstructural alternative, *Economic feasibility, Zoning, Flood forecast, Flood warning, Flood control, Costs, Project feasibility, Flood protection, *Flood plain management, Sensitivity analysis.

The purpose of this study is to examine the physical and economic feasibility of a number of nonstructural flood control measures and develop criteria for their use. Eleven such measures are selected; this report evaluates their overall physical and economic feasibility. The measures studied are: temporary and permanent closures for openings in existing structures; raising existing structures; construction of new structures on fill or columns; small walls or levees around structures; relocating or protecting damageable property; relocating existing structures and/or contents out of a flood hazard area; flood forecast, warning and evacuation; use of water resistant materials in construction; regulation of development of flood plain land through zoning ordinances, subdivision regulations and building codes; public acquisition of title or easement to flood plain land; and flood insurance. Cost estimtes, advantages, disadvantages and references are provided for each measure. A sensitivity analysis of flood damage in relation to various hydrologic, hydraulic, and economic parmeters was conducted. These parameters include elvation-frequency relationship, frequency 'skew,' depth-damage relationship, value of structure contents as a percentage of the value of a structure, type of structure, and location in the floodplain. The effectiveness of selected nonstructural measures was then evaluated by computing the damage reduced for several levels of protection. It was found that nonstructural measures have an important role alongside structural measures in reducing flood losses. Every measure investigated was found to be physically and economically feasible in some flood hazard situation, and particular applications and limitations were identified. (Coan-NC)
W79-01833

FLOOD PLAIN INFORMATION: PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W79-01850

FLOOD HAZARD INFORMATION: CLOVER CREEK, STILLWATER CREEK AND STILL-

WATER CREEK TRIBUTARIES, LOOMIS CORNERS, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01851

FLOOD PLAIN INFORMATION: SALT CREEK AND TRIBUTARIES, OLNEY, TEXAS.
Army Engineer District Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W79-01852

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH, JUNIATA RIVER, CLAYSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01853

FLOOD PLAIN INFORMATION: MUDDY BRANCH, MONTGOMERY COUNTY MARYLAND.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01854

FLOOD HAZARD INFORMATION: SACRAMENTO RIVER AND COTTONWOOD AND BATTLE CREEKS, COTTONWOOD-BEND AREA, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01855

FLOOD PLAIN INFORMATION: BIRD CREEK AND TRIBUTARIES, PAWHUSKA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-01856

FLOOD PLAIN INFORMATION: PROVO RIVER AND SLATE CANYON CREEK, PROVO, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01857

FLOOD PLAIN INFORMATION: COAL CREEK AND TRIBUTARIES, HENRYETTA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-01858

FLOOD PLAIN INFORMATION: PANTHER AND BEAR BRANCHES, MONTGOMERY COUNTY, TEXAS.
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 4A.
W79-01859

6G. Ecologic Impact Of Water Development

ECOLOGICAL RECOVERY OF REALIGNED STREAM CHANNELS,
Federal Highway Administration, Portland, OR.
T. J. McClellan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 657, Price codes: A05 in paper copy, A01 in microfiche. Report FHWA-OR-74-1, 1974. 98 p, 9 ref, 4 append.

Descriptors: *Fish populations, *Wildlife habitats, *Construction, *Oregon, *Channel morphology, Channel improvement, Ecology, Fish migration, Spawning, Bank protection, Embankments, River beds, On-site investigations.

A field investigation of 18 highway-related, stream channel changes in Oregon was made in 1973 to evaluate the effectiveness of natural processes in restoring conditions favorable to use as habitat of the altered streams by fish and of streamside areas by small game. Known conditions prior to channelization, the channel design, construction methods followed, and any measures taken to mitigate harm to the ecology of the stream were used as a basis for comparing the local effects of the various types of alteration. Design features found to be significantly damaging to the stream fishery or to wildlife were discussed in the report. Some measures to prevent or alleviate similar damage by future highway construction were suggested. An appendix presented the findings of a preliminary review of pertinent literature and the detailed case study made in 1972 of a representative stream alteration. (Adams-ISWS)
W79-01515

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 11. NATURAL AREAS OF THE LAKE MICHIGAN DRAINAGE BASIN AND ENDANGERED OR THREATENED PLANT AND ANIMAL SPECIES,
Wisconsin Univ.-Milwaukee. Dept. of Botany.
F. Stearns, and D. Lindsley.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL-ES-40 Vol. 11, Price codes: A05 in paper copy, A01 in microfiche. Argonne National Laboratory, Illinois, Publication No. ANL/ES-40, Vol. 11, September 1977. 90 p, 1 fig, 6 tab, 72 ref. W-31-109-Eng-38.

Descriptors: *Lake Michigan basin, *Endangered species, *Threatened species, *Natural areas, *Plant populations, *Animal populations, *Natural resources, Great Lakes, Lakes, Watersheds(Basins), Biological communities, Ecology, Ecosystems, Habitats, Michigan, Illinois, Wisconsin, Indiana, Preservation, Baseline studies, Beaches, Forests, Dunes, Prairies, Wetlands, Birds, Mammals, Reptiles, Amphibians, Fish.

This report: (1) enumerates and describes 139 designated natural areas in the Lake Michigan drainage basin--46 in Wisconsin, 45 in Michigan, 37 in Indiana, and 11 in Illinois; (2) lists endangered and threatened plants and animals in the basin; and (3) identifies critical natural communities in the basin. 'Natural area' is a tract of land which has retained its natural character or has regained it after disturbance; it may include significant geological, archaeological, or scenic features, support a highly diverse or unique fauna or flora, or illustrate ecological principles well. Nature preserves are scientifically, educationally, or culturally valuable, and provide aesthetic, practical, and long-range socio-economic benefits. Federal and state legislation on endangered and threatened species is reviewed, and annotated lists for the basin are provided. Endangered species include five mammals, six birds, four reptiles, nine fishes, and 10 plants, and threatened species include five mammals (plus 23 additional species), 15 birds, eight reptiles, 10 fishes, four amphibians, and 25 plants. Habitat degradation and destruction is though the most important factor threatening particular species; elimination of certain plant communities would lead to loss of many plant and animal species in the basin, or even extinction. Such communities are located in or on: (1) beaches and sand dunes, (2) prairies, (3) southern mesic forests, (4) wetlands, and (5) natural flowing springs. (Lynch-Wisconsin)
W79-01555

THE STUDY OF ENVIRONMENTAL PUBLIC POLICY: A PRELIMINARY DIRECTORY,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6B.
W79-01569

A PRELIMINARY ECOLOGICAL SURVEY OF DARDANELLE RESERVOIR PRIOR TO NUCLEAR FACILITY EFFLUENT DISCHARGE,
Arkansas Water Resources Research Center, Fayetteville.
C. B. Sinclair, and R. L. Watson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 236, Price codes: A04 in paper copy, A01 in microfiche. Technical completion report (No. 60), 1978. 45 p, 4 fig, 1 tab, 36 ref. Appendices available upon request from Center. OWRT A-012-ARK(1).

Descriptors: *Ecological surveys, Reservoirs, *Arkansas, *Dardanelle Reservoir(Ark), Nuclear power plants, Plankton, Benthos, Sampling, Zooplankton, Diatoms, Phytoplankton, Crustaceans.

A preliminary ecological survey of Dardanelle Reservoir during the construction phase of Ark. Power and Light Company's nuclear generating facility was conducted from Jan. 1970 - June 1974. The reservoir is characterized by relatively shallow depths and a high flow-thru rate. The reservoir carried a great deal of suspended materials and exhibited high turbidities throughout most of the year. Typical thermal stratification and oxygen depletion were only rarely observed. Many of the physico-chemical parameters exhibited relatively high values in comparison to other Arkansas lakes and reservoirs, but due to absence of prolonged periods of stratification, they did not undergo the extreme fluctuations sometimes observed in other reservoirs. Plankton and benthic samples were collected at least nine times per year from 10 stations. There were a great variety of forms in the phytoplankton with the diatoms making up a considerable portion. The level of turbidity appeared to dampen somewhat the extreme fluctuations sometimes found in 'bloom' periods. In the zooplankton the rotifers Brachionus, Keratella, and Polyarthra predominated followed by the microcrustaceans Cyclops and Bosmina. Both the plankton and benthic fauna showed great seasonal variation. The benthic fauna consistred primarily of Chironomidae, Oligochaeta, and Hexagenia with the Chronomidae predominating in the shallower depths and the Oligochaeta exhibiting increased abundance and importance in the deeper stations.
W79-01591

A MODEL FOR PREDICTING THE EFFECTS OF SEWAGE EFFLUENT ON WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 5C.
W79-01643

PRESERVING THE HERITAGE OF GASPARILLA ISLAND, AN APPROACH TO CONSERVATION OF THE ECONOMIC, CULTURAL, HISTORICAL, AND NATURAL RESOURCES OF THE ISLAND,
Conservation Foundation, Washington, DC.
J. Clark.
1978. 41 p, 12 fig, 6 tab, 10 ref.

Descriptors: *Survey, *Natural resources, *Islands, *Florida, Wetlands, Beach, Dunes, Mangrove swamps, Development, Conservation, *Gasparilla Island(Fla).

This report is a reconnaissance survey of Gasparilla Island resources with some general considerations for their conservation. The major subsystems, or ecological zones, are: beaches and dunes, hammocks and savannahs, wetlands and interior waters, and mangroves and estuarine waters. Each of these is discussed according to their different environmental functions, values, and suitabilities for development. (Steiner-Mass)
W79-01646

INLAND LAND USE ACTIVITIES AND GEORGIA'S COASTAL WATERS.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 4C.
W79-01651

IMPACT OF OFFSHORE OIL AND GAS DEVELOPMENT ON THE COASTAL ZONE: RE-

FORMING THE IMPACT ASSESSMENT PROCESS,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Resources.
J. K. Mitchell.
Coastal Zone Management Journal, Vol 4, No 3, p 299-327, 1978. 1 tab, 72 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Environmental effects, Coasts, Gas, Resources development, Management, *Outer Continental Shelf, Petroleum development, Environmental impact statements, Onshore impacts.

In an otherwise complex regulatory system, the federal Environmental Impact Statement process affords loca decision makers and coastal zone residents a rare opportunity to analyze the comprehensive range of land-use and environmenta issues that may arise from Offshore Continental Shelf (OCS) hydrocarbon development, while there is still time to formulate effective management strategies. As exemplified by the lease sale 40 statement, present onshore impact assessment procedures are sufficiently flawed to seriously compromise this goal. Critical deficiencies include failure to emphasize onshore impacts; insensitivity to spatial variations of impact; neglect of available data; rigid, unsupported assumptions; and preoccupation with short-term effects to the exclusion of more significant and dependent long-term consequences. Suggested reforms include preparation of separate exploration and development impact statements; establishment of special Council on Environmental Quality review procedures; modification of the judicial review process; and provision of additional support to local onshore OCS impact areas. (Sinha-OEIS)
W79-01783

TEXAS COASTAL MANAGEMENT PROGRAM ECOLOGICAL SYSTEMS COMPONENT, USER'S MANUAL.
Research and Planning Consultants, Inc., Austin, TX.
For primary bibliographic entry see Field 5C.
W79-01787

AN OVERVIEW OF NOAA'S ENERGY RESOURCES PROJECT ON FATE AND EFFECTS OF CONTAMINANTS IN MARINE ECOSYSTEMS AND ORGANISMS,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5C.
W79-01805

ENVIRONMENTAL ASSESSMENT OF ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 1, BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Programs.
For primary bibliographic entry see Field 5C.
W79-01811

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL 2. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continenta Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01818

DEMERSAL FISH AND SHELLFISH RESOURCES OF THE GULF OF ALASKA FROM CAPE SPENCER TO UNIMAK PASS 1948 - 1976. A HISTORICAL REVIEW. VOLUME 3,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
For primary bibliographic entry see Field 5C.
W79-01821

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. FINAL REPORTS OF PRINCIPAL INVESTIGATORS, VOL. 3. BIOLOGICAL STUDIES.
National Oceanic and Atmospheric Administrations, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 5C.
W79-01822

COMMUNITY STRUCTURE, DISTRIBUTION, AND INTERRELATIONSHIPS OF MARINE BIRDS IN THE GULF OF ALASKA,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 5C.
W79-01823

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01839

PUBLIC HEARING ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT RELATING TO PALM BEACH COUNTY SEWAGE TREATMENT IMPROVEMENT PROGRAM.
Palm Beach County Board of Commissioners, FL.
For primary bibliographic entry see Field 5D.
W79-01840

ENVIRONMENTAL ASSESSMENT OF WATER QUALITY MANAGEMENT PLANS.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-01844

AN ECONOMIC AND ENVIRONMENTAL EVALUATION OF ALTERNATIVE LAND DEVELOPMENT AROUND NEW HAMPSHIRE LAKES,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5G.
W79-01904

7. RESOURCES DATA

7A. Network Design

A PRELIMINARY INVESTIGATION ON SEISMIC TECHNIQUES USED TO LOCATE CAVITIES IN KARST TERRAINS,
Chester Engineers, Inc., Coraopolis, PA. Geotechnical Dept.
For primary bibliographic entry see Field 2F.
W79-01940

THE A, B, C'S OF FINDING AND DELINEATING CAVES WITH APPARENT RESISTIVITY MEASUREMENTS,
Monongahela National Forest, Elkins, WV.
For primary bibliographic entry see Field 2F.
W79-01941

7B. Data Acquisition

WATER RESOURCES PLANNING FOR RIVERS DRAINING INTO MOBILE BAY,
Alabama Univ., University. Dept. of Chemical and Metallurgical Engineering.
For primary bibliographic entry see Field 4A.
W79-01510

ENVIRONMENTAL ANALYSES IN THE KOOTENAI RIVER REGION, MONTANA,
Army Terrestrial Sciences Center, Hanover, NH.
H. L. McKim, L. W. Gatto, C. J. Merry, B. E. Brockett, and M. A. Bilello.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 500, Price codes: A04 in paper copy, A01 in microfiche. CRREL Special Report 76-13, November 1976, 53 p, 21 fig, 5 tab, 11 ref, 3 append.

Descriptors: *Remote sensing, *Satellite(Artificial), *Montana, *Data transmission, *Lake morphology, Ice cover, Snowpacks, Water quality, Eutrophication, Telemetry, Stratification, Circulation, *Kootenai River(Mont).

This investigation (1) compiled and analyzed climatic data for the past 10 years from all available weather observing stations in the East Kootenai River Basin, (2) analyzed changes in ice and snow cover, and turbidity and plankton blooms on Lake Koocanusa, (3) assessed the present limnology of Lake Koocanusa and the potential for water quality problems, especially eutrophication, and (4) demonstrated the reliability of the LANDSAT Data Collection Platform (DCP)-Martek Water Quality Monitor system for acquisition of data from a remote site. Results indicated that the Kootenay region is about twice as cold as the Libby region in winter, and that reservoir ice first forms along the shore in the northern region in lake November and in the southern part in mid-December, with total freeze-over usually occurring 2 to 4 weeks later. Ice break-up in the northern sections usually occurs 1-3 weeks later than in southern areas; average annual snowfall is 42 to 144 inches, with ice thickness and snowfall varying with relief. Variations in areal distribution of snow within the basin and ice cover on the reservoir were observable for periods from January to October 1973. Reservoir turbidity was observed to increase south of Ellsworth and Stenerson Mountains. Low algal productivity observed was due to the algae being circulated most of the time below the depth of 1% light to high turbidity. The DCP-Martek system operated well, and reliable data were received while the system was located in the pool above Libby Dam and downstream below the dam. Brief interruptions in data transmissions occurred when the Martek sensor showed a few minor inconsistencies, but the system demonstrated the feasibility of this technique for data acquisition from remote sites. (Adams-ISWS)
W79-01512

PART I: APPLICATION OF PULSE POLAROGRAPHY AND PULSE ANODIC STRIPPING TO THE DETERMINATION OF SELECTED HEAVY METALS IN NATURAL WATERS--PART II: APPLICATION OF CONTROLLED POTENTIAL COULOMETRIC TECHNIQUES TO THE DETERMINATION OF URANIUM,
Tennessee Univ., Knoxville.
For primary bibliographic entry see Field 5A.
W79-01517

APPLICATION OF REMOTE SENSING IN ESTIMATING EVAPOTRANSPIRATION IN THE PLATTE RIVER BASIN,
Nebraska Univ., Lincoln.
B. L. Blad, and N. J. Rosenberg.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-30634, Price codes: A03 in paper copy, A01 in microfiche. NASA-CR-148775, April 30, 1976. 33 p, 15 fig, 1 tab, 19 ref, 1 append. NASA-NGL28-004-020.

Descriptors: *Evapotranspiration, *Remote sensing, *Model studies, Temperature, Crop production, Hydrology, Irrigation, Mass transfer, Alfalfa, Thermometers, *Nebraska, *Platte River Basin(Neb), *Thermal scanners.

A 'resistance model' and a mass transport model for estimating evapotranspiration were tested on large fields of naturally sub-irrigated alfalfa. Both models make use of crop canopy temperature data, obtained with an IR thermometer and with leaf thermocouples. A Bowen ratio-energy balance model, adjusted to account for underestimation of evapotranspiration during periods of strong sensible heat advection, was used as the standard against which the resistance and mass transport

models were compared. Daily estimates by the resistance model were within 10% of estimates made by the Bowen model. Daily estimates by the mass transport model did not agree quite as well. Performance was good on clear and cloudy days and also during periods of non-advection and strong advection of sensible heat. The performance of the mass transport and resistance models was less satisfactory for estimation of fluxes of latent heat for short-term (15 min) periods. Both models tended to overestimate at low fluxes. (Roberts-ISWS)
W79-01521

SNOWPACK GROUND TRUTH: RADAR TEST SITE, STEAMBOAT SPRINGS, COLORADO, APRIL 8-16, 1976,
Bittinger (M. W.) and Associates, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 2C.
W79-01527

TECHNIQUES FOR SAMPLING SALT MARSH BENTHOS AND BURROWS,
Georgia Univ., Athens. Dept. of Geology.
R. W. Frey, P. B. Basan, and R. M. Scott.
The American Midland Naturalist, Vol. 89, No. 1, p 228-234, January, 1973. 2 fig, 9 tab.

Descriptors: *Sampling, *Salt marshes, *Benthos, Marshes, *Burrows, *Georgia.

Certain salt marsh benthos are difficult to collect quantitatively, especially the mobile epibenthos and endobenthos that dwell within or below dense grass-root masses. Techniques adapted in conjunction with a study of Georgia marshes helped to resolve many of these difficulties. Useful methods included: (1) High-walled quadrat frames to entrap and collect mobile animals. Marsh grass inside the quadrat is first cropped nearly to root level and removed to secure quantitative grass samples and to clear the area of obstructions in collecting the crabs and other epibenthos. Intrusion causes the retreat of crabs to their burrows but this problem is handled by leaving the area at regular intervals, allowing the remaining animals to return to the surface, then returning to collect them. (2) Can cores were used to obtain volumetric substrate samples, from which endobenthos were recovered by means of a combined sieving-staining-flotation procedure. (3) Polyester plastic casts of burrows and burrow networks were used to evaluate depth, density, volume, and conspecific morphologies of burrows. (Maroncelli-Mass)
W79-01634

USE OF LANDSAT DATA TO RELATE WATER DEPTH TO OBSERVED AREA OF INUNDATION IN COASTAL MARSHES,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
J. M. Graff.
M.S. Thesis, Louisiana State University and Agricultural and Mechanical College. December, 1976. 66 p, 13 fig, 5 tab, 23 ref.

Descriptors: *Coastal marshes, *Remote sensing, *Mapping, Wetlands, Census, Aerial photography, Surveys, Terrain analysis, Marsh management, Louisiana, Infrared radiation, Distribution patterns, Marshes, LANDSAT, Water surface area, *Water depth, *Water level fluctuations.

Use of LANDSAT data to measure changes in water surface areas in a 30.64 sq. kilometer section of Louisina's coastal marsh was evaluated. Optical a computer estimates of water surface areas from LANDSAT data were compared to optical estimates derivedn from low altitude infrared aerial photography. Water depths were taken coincident to imagery and photography and related to the surface areas obtained by concidendent to imagery and photography and relted to the surface areas obtained by the three methods. LANSAT data were determined not to be well suited to measurement of water surfaces areas in this application because of lack of flexibility in scheduling, insufficient resolution; need for broader spectral receptivity; and too small a scale to properly study such a small area. In coastal marshes numerous small tidal pools and stands are smaller than 100 m; significant hydrologic changes occur in short periods of time; and the surface character is predominantly a heterogeneous mixture of water vegetation, and mud which varies in percent composition from one place to another, and consequently has no distinctive tones, patterns, or textures on the imagery. (Steiner-Mass)
W79-01637

APPLICATION OF LANDSAT IMAGE WETLAND STUDY AND LAND CLASSIFICATION IN WEST TENNESSEE,
Tennessee University Space Inst. Tullahoma. Remote Sensing Div.
F. Shahrokhi, and N. L. Jones.
1977. 61 p, 17 fig, 6 tab, 18 ref.

Descriptors: *Remote sensing, *Tennessee, *Land use, *Wetlands, Aerial photography, *Classification, Mapping, Earth-water interfaces, Watershed management, LANDSAT data, West Tennessee.

Information is given on basic equipment and methods for analysis of photographic data obtained from LANDSAT as well as high and low altitude aircraft. In addition, instructions are provided for utilizing such equipment and methods to explore a specific application. This application involves a study to determine land use classifications for a selected watershed in West Tennessee with special emphasis on determining wetland boundaries, and there by provide resource information to appropriate agencies for management and preservation programs. (Steiner-Mass)
W79-01638

THE VERIFICATION OF LANDSAT DATA IN THE GEOGRAPHICAL ANALYSIS OF WETLANDS IN WEST TENNESSEE,
Tennessee Univ., Knoxville.
J. Rehder, and D. Quattrochi.
National Aeronautics and Space Administration, Contractor Report 3012. June, 1978. 134 p, 9 fig, 8 tab, 31 maps, 27 ref, 2 append.

Descriptors: *Wetlands, *Remote sensing, *Tennessee, *Technical feasibility, *Classification, Mapping, *Land use, Earth-water interfaces, Swamps, Seasonal, *LANDSAT data, West Tennessee.

LANDSAT imagery is a reliable data source for detecting, identifying, measuring, and mapping wetlands in West Tennessee. the degree of cartographic and measurement accuracy, however, depends upon the interpretative and planimetric qualities of the data, such as internal geometric distortion, edge sharpness, and scale of the imagery; and the skill of the interpreter. Although the signature exhibited by wetlands is the primary key to their delimitation, the color and tone of swamplands is affected by seasonal dynamics. The ease of difficulty of wetlands detection fluctuates temporarily; the amount of water and foliation present are cognitive views for seasonal swampland mapping. 1:25, 000 sale color composite imagery is the most useful type of imagery for accurately mapping and measuring wetlands from LANDSAT data. (Steiner-Mass)
W79-01639

REMOTE SENSING OF WETLANDS,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
N. E. G. Roller.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-26588, Price codes: A08 in paper copy, A01 in microfiche. Report 193400-14-T to National Aeronautics and Space Administration, Washington, D.C., Office of University Affairs, March, 1977. 155 p, 29 fig, 14 tab, 72 ref.

Descriptors: *Wetlands, *Remote sensing, *Cost comparisons, *Census, Mapping, Aerial photography, Surveys, Terrain analysis, Marsh management, Wetland inventories.

Aerial photography is the form of remote sensing from which the greatest amounts of wetlands information can be derived. For extensive, general-purpose wetland inventories, however, the use of LANDSAT data may be more cost-effective. Airborne multispectral scanners and radar are, in the main, too expensive to use unless absolutely required. Multistage sampling employing space and high altitude remote sensing data in the initial stages appears to be an efficient survey strategy for gathering non-point specific wetlands inventory data over large areas. The operational mode of remote sensing in supplying inventory data for application to several typical wetland management problems is illustrated by summary descriptions of past ERIM projects. (Steiner-Mass)
W79-01642

IMPROVED TECHNIQUES FOR MARKING AND SAMPLING BAND-APPLIED FERTILIZERS AND PESTICIDES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 5A.
W79-01709

ASSEMBLY FOR MOUNTING HYDRAULIC SOIL CORE SAMPLER ON TRACTOR FRONT,
Agricultural Research Service, Stoneville, MS.
L. H. Ginn, L. G. Heatherly, and W. J. Russell.
Soil Science Society of America Journal, Vol 42, No 3, p 512-514, May-June, 1978. 4 fig, 6 ref.

Descriptors: Cores, *Sampling, *Soil types, Hydraulic equipment, *Instrumentation, *Core samplers.

A front-mounted tractor assembly for support of a hydraulic soil core sampler was constructed. The design satisfied requirements for rapid soil or root core sampling. An essential part of the assembly is a tool bar which allows lateral movement of the mounted core sampler. The assembly with mounted sampler is capable of extracting 1.9 to 10.2-cm diameter cores to depths as great as 125 cm throughout a 102-cm lateral path. (Skogerboe-Colorado State)
W79-01710

REMOTE SENSING OF WATER LEVELS IN SMALL-DIAMETER WELLS,
Department of Agriculture, Watkinsville, GA.
A. D. Lovell, J. W. Ellis, R. R. Bruce, and A. W. Thomas.
Agricultural Engineering, Vol. 59, No. 10, p 44-45, October 1978. 4 fig.

Descriptors: *Remote sensing, *Electronic equipment, *Water level fluctuations, *Piezometers, Water pressure, Shallow wells, Costs, Instrumentation, Temperature, Humidity, Condensation, *Pressure transducers, Circuitry.

A sensing device has been developed to measure water level changes in small-diameter (1/2 inch) piezometrs at depths between 6 inches and 10 feet. The device consists of a motor, sensor electrodes, and internal electronic circuitry, as well as cables and pulleys. It was designed to resist temperature variations as well as humidity and condensation problems. Materials cost between $39.00 and $75.00, depending on the sensitivity required. (Visocky-ISWS)
W79-01924

REMOTE SENSING ASSESSMENT OF DAM FLOODING HAZARDS: METHODOLOGY DEVELOPMENT FOR THE NEW YORK STATE DAM SAFETY PROGRAM,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 4A.
W79-01980

7C. Evaluation, Processing and Publication

APPLICATION IN THE WATER INDUSTRY OF REGIONAL GEOCHEMICAL MAPS OF ENGLAND AND WALES,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5B.
W79-01501

THE 1976 DROUGHT AND NITRATE LEVELS IN THE RIVER EXE BASIN,
Exeter Univ. (England). Dept. of Geography.
For primary bibliographic entry see Field 5B.
W79-01504

VARIATIONS IN THE DURATION OF STABLE SNOW COVER IN THE USSR,
For primary bibliographic entry see Field 2C.
W79-01506

GREAT LAKES SHORELINE DAMAGE SURVEY; BROWN, DOUGLAS, AND RACINE COUNTIES, WISCONSIN, APPENDIX II,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 4A.
W79-01530

GREAT LAKES SHORELINE DAMAGE SURVEY; MUSKEGON, MANISTEE, SCHOOLCRAFT, CHIPPEWA, ALCONA, AND HURON COUNTIES, MICHIGAN, APPENDIX III,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01531

ENGINEERING STUDIES FOR A CONTRACT FOR FIELD INVESTIGATION OF HIGH WATER DAMAGE IN OSWEGO COUNTY, NEW YORK, APPENDIX IV,
Saint Lawrence-Eastern Ontario Commission, Watertown, NY.
For primary bibliographic entry see Field 4A.
W79-01532

MEASUREMENT OF COASTAL BLUFF RECESSION FROM AERIAL PHOTOGRAPHS, MUSKEGON COUNTY, MICHIGAN, APPENDIX VII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01533

COMPARISON OF FIELD DATA COLLECTIONS TO DATA COLLECTED USING STUDY INSTRUMENTS IN MUSKEGON AND MANISTEE COUNTIES, MICHIGAN, APPENDIX VIII,
Michigan Univ., Ann Arbor. Coastal Zone Lab.
For primary bibliographic entry see Field 4A.
W79-01534

TRANSIENT TWO-DIMENSIONAL PROBLEMS UTILIZING THE LEAST SQUARES ALGORITHM,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W79-01557

REMOTE SENSING OF WETLANDS,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 7B.
W79-01642

FERTILIZATION DECISION MODEL-A SYNTHESIS OF SOIL AND PLANT PARAMETERS IN A COMPUTERIZED PROGRAM,
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 2G.
W79-01714

PATTERN RECOGNITION TECHNIQUES APPLIED TO OIL IDENTIFICATION,
Connecticut Univ., Storrs. Dept. of Electrical Engineering and Computer Science.
For primary bibliographic entry see Field 5A.
W79-01747

TEXAS COASTAL MANAGEMENT PROGRAM ECOLOGICAL SYSTEMS COMPONENT, USER'S MANUAL.
Research and Planning Consultants, Inc., Austin, TX.
For primary bibliographic entry see Field 5C.
W79-01787

AIRBORNE MULTISPECTRAL MAPPING OF THE INTERTIDAL ZONE OF SOUTHERN ALASKA,
Environmental Research Inst of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 5C.
W79-01825

FLOOD PLAIN INFORMATION: PIGEON CREEK, BENTLEYVILLE, FALLOWFIELD TOWNSHIP AND SOMERSET TOWNSHIP, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W79-01850

FLOOD HAZARD INFORMATION: CLOVER CREEK, STILLWATER CREEK AND STILLWATER CREEK TRIBUTARIES, LOOMIS CORNERS, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01851

FLOOD PLAIN INFORMATION: SALT CREEK AND TRIBUTARIES, OLNEY, TEXAS.
Army Engineer District Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W79-01852

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH, JUNIATA RIVER, CLAYSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01853

FLOOD PLAIN INFORMATION: MUDDY BRANCH, MONTGOMERY COUNTY MARYLAND.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W79-01854

FLOOD HAZARD INFORMATION: SACRAMENTO RIVER AND COTTONWOOD AND BATTLE CREEKS, COTTONWOOD-BEND AREA, CALIFORNIA.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01855

FLOOD PLAIN INFORMATION: BIRD CREEK AND TRIBUTARIES, PAWHUSKA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-01856

FLOOD PLAIN INFORMATION: PROVO RIVER AND SLATE CANYON CREEK, PROVO, UTAH.
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W79-01857

FLOOD PLAIN INFORMATION: COAL CREEK AND TRIBUTARIES, HENRYETTA, OKLAHOMA.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 4A.
W79-01858

FLOOD PLAIN INFORMATION: PANTHER AND BEAR BRANCHES, MONTGOMERY COUNTY, TEXAS.
Army Engineer District, Galveston, TX.
For primary bibliographic entry see Field 4A.
W79-01859

FLOOD FREQUENCY DESIGN IN SPARSE-DATA REGIONS,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W79-01901

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN TERRY COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
A. E. Bell, and S. Morrison.
Report 222, September 1978. 68 p, 18 tab, 72 ref, 24 map.

Descriptors: *Groundwater resources, *Texas, Aquifers, *Data collections, Groundwater, Maps, Water resources, Aquifer characteristics, Groundwater availability, Groundwater mining, Overdraft, Groundwater recharge, Pumping, Projections, Saturated flow, Water wells, *Terry County(Texas), *Ogallala aquifer(Texas), Pumpage rates, Pumping lifts, Well yields.

This is one of numerous planned county studies covering the declining groundwater resource of the Ogallala aquifer in the high Plains of Texas. The report contained maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala aquifer in Terry County and the projected depletion of this water supply by decade periods through the year 2020. The report also contained estimates of pumpage, pumping lifts, and other data related to current and future water use in the county. However, the report did not attempt to project that portion of the volume of water in underground storage which may be ultimateley recoverable. the Ogallala aquifer in Terry County contained approximately 3.2 million acre-feet ofwater in 1974. Historical pumpage has exceeded 130,000 acre-feet annually, which is more thatn twuicef the rate of natural recharge to the aquifer in the county. This overdraft is expected to continue, ultimately resulting in reduced well yields, reduced acreage irrigated, and reduced agricultural production. (Humphreys- ISWS)
W79-01927

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN YOAKUM COUNTY TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
A. E. Bell, and S. Morrison.
Report 221, September 1978. 68 p, 18 tab, 72 ref, 24 map.

Descriptors: *Groundwater resources, *Texas, *Aquifers, *Data collections, Groundwater, Maps, Water resources, Aquifer characteristics, Groundwater recharge, Water supply, Groundwater availability, Groundwater mining, Overdraft, Pumping,

Projections, Saturated flow, Water wells, *Yoakum County(Texas), *Ogallala aquifer(Texas), Pumpage rates, Pumping lifts, Well yields.

This is one of numerous planned county studies covering the declining groundwater resource of the Ogallala aquifer in the High Plains of Texas. The report contained maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala aquifer in Yoakum County and of the projected depletion of this water supply by decade periods through the year 2020. The report also contained estimates of pumpage, pumping lifts, and other data related to current and future water use in the county. However, the report did not attempt to project that portion of the volume of water in underground storage which may be ultimately recoverable. The Ogallala aquifer in Yoakum County contained approximately 4.5 million acre-feet of water in 1974. Historical pumpage has exceeded 130,000 acre-feet annually, which is more than three times the rate of natural recharge to the aquifer in the county. This overdraft is expected to continue, ultimately resulting in reduced well yields, reduced acreage irrigated, and reduced agricultural Production (Humphreys-ISWS)
W79-01928

OCCURRENCE AND QUALITY OF GROUND WATER IN BAYLOR COUNTY, TEXAS,
Texas Dept. of Water Resources, Austin.
R. D. Preston.
Report 218, July 1978. 123 p, 22 fig, 11 tab, 110 ref.

Descriptors: *Groundwater, *Texas, *Data collections, *Water quality, *Aquifers, Groundwater availability, Water supply, Aquifer characteristics, Water table, Water levels, Well data, Test wells, Drillers logs, Hydrogeology, Water properties, Chemical analysis, Dissolved solids, Hardness(Water), Nitrates, Chlorides, Iron, Boron, Brine disposal, Porosity, Permeability, Transmissivity, Aquifer systems, Geology, *Baylor County(Texas).

Baylor County lies within the drainage basins of the Brazos and Red Rivers in North-central Texas, covering and area of about 857 square miles. Permia rocks of the Wichita and Clear Fork Groups are found at the surface within the county except where they are overlain by erratic deposits of Pleistocene and Recent alluvium of thee Quaternary System. Small to moderate quatities of fresh to slightly saline groundwater are produced from recent alluvial deposits. Water quality is generally good in this aquifer. However there are some local problems that are probably caused by poor quality water flowing in adjacent streams. The Seymor Formation of Pleistocene age is the major source of groundwater. In parts of a 73 square-mile area extending from the city of Seymour west to the Knox County line and lying between the Brazos and Wichita Rivers, wells can sustain yields up to 900 gallons per minute. Water quality is generally good in the Seymour Formation. More tha 90% og the wells sampled produce water with less than 1,000 milligrams per liter dissolved solids. Chloride content in the Permian and Quaternary rocks ranged from 5 to 3,240 milligrams per liter, ad 65 samples contained more than the 250 milligrms per liter. (humphreys-ISWS)
W79-01929

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN COCHRAN COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources, Austin.
A. E. Bell, and S. Morrison.
Report 217, July 1978. 68 p, 18 tab, 70 ref, 24 map.

Descriptors: *Groundwater resources, *Texas, *Aquifers, *Data collections, Groundwater, Maps, Water resources, Aquifer characteristics, Groundwater recharge, Water supply, Groundwater availability, Groundwater mining, Overdraft, Pumping, Projections, Saturated flow, Water wells, *Cochran County(Texas), *Ogallala aquifer(Texas), Pumpage rates, Pumping lifts, Well yields.

This is one of numerous planned county studies covering the declining grounddwater resource of the Ogallala aquifer in the High Plains of Texas. The report contained maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala aquifer in Cochran County and of the projected depletion of this water supply by decade periods through the year 2020. The report also contained estimates of pumpage, pumping lifts, and other data related to current and future water use in the county. However, the report did not attempt to project that portion of the volume of water in underground storage which may be ultimately recoverable. The Ogallala aquifer in Cochran County contained approximately 2.9 million acre-feet of water in 1974. Historical pumpage has exceeded 90,000 acre-feet annually, which exceeds considerably the rate of natural recharge to the aquifer in the county. This overdraft is expected to continue, ultimately resulting in reduced well yields, reduced acreage irrigated, and reduced agricultural production. (Humphreys-ISWS)
W79-01930

ANALYTICAL STUDY OF THE OGALLALA AQUIFER IN LUBBOCK COUNTY, TEXAS, PROJECTIONS OF SATURATED THICKNESS, VOLUME OF WATER IN STORAGE, PUMPAGE RATES, PUMPING LIFTS, AND WELL YIELDS,
Texas Dept. of Water Resources Austin.
A. E. Bell, and S. Morrison.
Report 216, June 1978. 68 p, 18 tab, 70 ref, 24 map.

Descriptors: *Groundwater resources, *Texas, *Aquifers, *Data collections, Groundwater, Maps, Water resources, Aquifer characteristic, Groundwater recharge, Water supply, Groundwater availability, Groundwater mining, Overdraft, Pumping, Projections, Saturated flow, Water wells, *Lubbock County(Texas), *Ogallala aquifer(Texas), Pumping rates, Pumping lifts, Well yields.

This is one of numerous planned county studies covering the declining grounddwater resource of the ogallala aqufer in the High Plains of Texas. The report contained maps, charts, and tabulations which reflect estimates of the volume of water in storage in the Ogallala aquifer in Lubbock County and of the projected depletion of this water supply by decade periods through the year 2020. The report also contained estimates of pumpage, pumping lifts, and other data related to current and future water use in the county. However, the report did not attempt to project that portion ofthe volume of water in underground storage which may be ultimately recoverable. The Ogallala aquifer in Lubbock County contained approximately 5.5 million acre-feet of water in 1974. Historical pumpage has exceeded 150,000 acre-feet annually, which is many times the rate of natural recharge to the aquifer in the county. This overdraft is expected to continue, ultimately resulting in reduced well yields, reduced acreage irrigated, and reduced agricultural production. (Humphreys-ISWS)
W79-01931

WATER WELL PRODUCTIVITY RELATED TO PHOTO-LINEAMENTS IN CARBONATES OF FREDERICK VALLEY, MARYLAND,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 2F.
W79-01954

GROUNDWATER POTENTIAL OF THE KARST REGIONS OF ALBERTA, CANADA,
Research Council of Alberta, Edmonton.
For primary bibliographic entry see Field 2F.
W79-01955

CURRENT PROBLEMS IN THE RATIONAL EXPLOITATION OF KARST WATER,
Institute for Geological and Geophysical Research, Belgrade (Yugoslavia).
For primary bibliographic entry see Field 2F.
W79-01958

HYDROLOGICAL PROBLEMS OF JUFRA WELL FIELD, LIBYA,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-01963

EVALUATION OF SULFATE WATER QUALITY IN THE NORTH-CENTRAL KENTUCKY KARST,
Bethel Research Association, Louisville, KY.
For primary bibliographic entry see Field 5B.
W79-01966

CHLORIDE ION VARIATIONS IN SOME SPRINGS OF THE GREEN-BRIER LIMESTONE KARST OF WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5B.
W79-01967

ROAD SALTS AND QUALITY OF GROUNDWATER FROM A DOLOMITE AQUIFER IN THE CHICAGO AREA,
Illinois Univ. at Chicago Circle. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W79-01968

HEAVY METAL ADDITIONS TO WATERS OF THE JOPLIN AREA, TRI-STATE MINING DISTRICT, MISSOURI,
Missouri Univ.-Rolla
For primary bibliographic entry see Field 5B.
W79-01969

A MANUAL FOR HYDROLOGIC TIME SERIES DESEASONALIZATION AND SERIAL DEPENDENCE REDUCTION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, and K. N. Rajo Rao.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 632, Price codes: A08 in paper copy, A01 in microfiche. IIHR Report No 199, June 1977. 151 p, 23 ref, 8 append. OWRT A-054-IA(6). 14-34-0001-6016.

Descriptors: *Stochastic processes, Hydrology, *Computer studies, *Statistical models, *Planning, Operations research, Model studies, *Time series analysis, Statistical methods, Deseasonalization, Data processing, Computers, Statistics, Water resources.

Procedures for analysis of stochastic structure of hydrologic time series were described using an approach which is realistic, practical, and compatible with a subsequent data generation. Essentially, the procedure consists of identifying and estimating annual periodicities in means, standard deviations, and autocorrelation coefficients in the time series. Estimated parameters and computed time dependence structure are removed from the original time series, thereby reducing it to a second order stationary and serially independent process. This aids in constructing a general deterministic-stochastic model representing the relevant time series which can be used for generating synthetic sequences of data that are statistically indistinguishable from the historic data. For demonstration, the approach was applied to real-life problems relating to monthly, weekly, and daily values of hydrologic time series and the results are illustrated. (Majtenyi-IPA)
W79-01989

Group 8A—Structures

8A. Structures

COLLAPSIBLE AND EXPANSIBLE BARRAGE,
Pirelli Furlanis - Applicazioni Idrauliche Agricole Gomma S.p.A., Milan (Italy). (Assignee).
A. Colamussi, and V. Merli.
U.S. Patent No. 4,103,496, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 57, August 1, 1978.

Descriptors: *Patents, *Barriers, *Structures, *Dams, Movable dams, Obstruction to flow, Flow control.

A collapsible and expansible barrage or barrier is described which is composed of a metallic flap and flexible sheet of material, both of which are fixed to a base structure at the bottom of a waterway such as a river, arm of the sea, lagoon or the like, which is to dammed up. The invention provides stability to the barrage in expanded condition when it is enduring stresses such as a flood-wave in a river or the undulating motion in a stretch of sea or lagoon. The base or threshold structure is provided with a hollow recess for housing the barrage in its collapsed state. Means are provided for admitting or extracting water into the closed space defined by the threshold structure, the metallic flap and the flexible sheet. An airtank admits pressurized air into the barrage. (Sinha-OEIS)
W79-01869

AIR-REGULATED SIPHON SPILLWAYS AT SPELGA DAM,
Ferguson and McIlveen, Belfast (Northern Ireland).
For primary bibliographic entry see Field 8B.
W79-01925

WAVE FORCES ON CAUSEWAY-TYPE COASTAL BRIDGES,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-01983

8B. Hydraulics

THE USE OF INCLINED BOREHOLES FOR WELL DEVELOPMENT,
Institute of Geological Sciences, London (England).
J. B. W. Day, K. Rowe, M. Price, and T. K. Tate.
Journal of the Institution of Water Engineers and Scientists, Vol 32, No 4, p 329-340, July 1978. 8 fig, 2 tab, 4 ref.

Descriptors: *Water wells, *Model studies, *Water supply development, *Laboratory tests, *On-site tests, Boreholes, Water yield improvement, Water yield, Groundwater, Aquifers, Well data, Hydraulic models, Water quality, Drawdown, On-site investigations, Foreign countries, Foreign research, *England, Water well development.

The systematic development of a well by intersecting inclined bores ('rakers') drilled from the surface has been attempted. Initial sand tank model studies indicated that, under unconfined conditions with four tubes disposed radially and inclined at 60 deg to the horizontal and under differing levels of the water table, increases in the yield of a central well of about one-third could be obtained for a fixed drawdown. Subsequent field tests on a Chalk well at Lyng, Norfolk, have shown greater increases in yield: three boreholes which were inclined at 45 deg and drilled to intersect a central well about 31 m below the average level of the water table more than doubled its yield. In both cases, results tended to confirm predictions based on theoretical relationships between well diameter and yield for both homogeneous and fissure flow aquifers. (Humphreys-ISWS)
W79-01503

EFFECTS OF CONSTRUCTION OF LIBERTY STATE PARK ON HYDRAULIC CHARACTERISTICS OF NEW YORK HARBOR; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
R. F. Athow, Jr., and R. A. Boland, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 471, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper H-76-18, Sept 1976. 156 p, 88 fig, 39 tab.

Descriptors: *Harbors, *Model studies, *Hydraulic models, *New Jersey, Currents(Water), Velocity, Tides, Tidal waters, Circulation, Parks, Effects, Salinity, Dye releases, Hydraulics, Estuaries, Rivers, *New York Harbor.

An existing comprehensive physical model that correctly reproduced tides, tidal currents, and density currents throughout the entire New York Harbor was used to determine the effects of constructing a proposed State park complex on the Jersey City waterfront, just west of Ellis and Liberty Islands. The study included tests in the model of seven different park configurations to define their effects on tidal heights, current velocities, surface current patterns, salinities, and flushing characteristics of a proposed Serpentine (a tidal-influenced canal west of the park area). Based on the results of the model tests, the following conclusions were reached: (1) none of the plans tested would have any significant effects on tidal heights or tidal phasing in the study area; (2) the plans tested would not change the velocity regime of the area, except very locally and with magnitudes not thought to be hazardous to safe navigation or to increase the existing erosion potential of the area; (3) the existing salinity regime of the area would not significantly change as a result of the plans tested; (4) in plans 1, 4, and 7, which include the Serpentine, mass flow will occur through the Serpentine, and a small gyre rotating counterclockwise will develop at the approximate location of salinity and dye sta 2, indicating no through flow at this station, only rotational motion; and (5) dye released at the westernmost end of Morris Canal Basin will move through the Serpentine and be flushed out the south end of the Serpentine, resulting in increased dye concentrations in the wildlife area and a lesser increase at the south entrance to the Serpentine. (Sims-ISWS)
W79-01518

HYDRAULICS AND STABILITY OF TIDAL INLETS,
Coastal Engineering Research Center, Fort Belvoir, VA.
F. F. Escoffier.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-045 523, Price codes: A04 in paper copy, A01 in microfiche. Final Report, GITI-13, August 1977. 75 p, 19 fig, 5 tab, 44 ref, 1 append. DACW 72-74-C-0005.

Descriptors: *Inlets(Waterways), *Tides, *Hydraulics, Coasts, Estuaries, Bays, Beaches, Stability, Flow, Ocean circulation, Tidal effects, Tidal waters, Water circulation, Erosion, Beach erosion, Model studies, Hydraulic models, Reviews, Movable-bed models.

This report presented a summary of several of the important basic developments pertaining to analysis of the hydraulics and related stability of tidal inlets. The original inlet stability concept proposed by Escoffier was extended in light of recent work. The report also contained brief discussions on tidal inlet characteristics and functional design requirements as well as case studies of selected inlets on the U.S. coasts. (Sims-ISWS)
W79-01519

FLOATING BREAKWATERS: AN IDEA WHOSE TIME HAS RETURNED,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
B. H. Adee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 048, Price codes: A02 in paper copy, A01 in microfiche. Report No WSG-TA 75-27, IEEE Ocean, p 707-715, 1975. 20 fig, 6 ref.

Descriptors: *California, *Oregon, *Washington, *Canada, *Breakwaters, *Coastal structures, *Design, *Construction, Waves(Water), Frequency, Comparative costs, Performance, Marinas, Model studies, *Floating breakwaters, *British Columbia(Canada), A-frame breakwaters, Sea grant program.

A review of recent developments in the construction of floating breakwaters was presented. Types of breakwaters considered were the A-frame used at Lund, British Columbia; Alaska modules installed at Tenakee, Sitka, and Whittier, California; those used at Friday Harbor, Holmes Harbor, and Port Orchard, Washington, and Yaquina Bay, Oregon; and many others in the prototype testing stages. Because the performance of floating breakwaters is very sensitive to incident wave frequency, comparisons of performance were made over a range frequencies. Construction techniques and materials were examined, and their field performances were assessed. Some data on the effectiveness of each of the breakwaters and their cost were included for comparison purposes. (See also W76-10460, and W78-00842) (Singh-ISWS)
W79-01525

FLOATING BREAKWATER FIELD ASSESSMENT PROGRAM, FRIDAY HARBOR, WASHINGTON,
Washington Univ., Seattle. Dept. of Mechanical Engineering.
B. H. Adee, E. P. Richey, and D. R. Christensen.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 183, Price codes: A11 in paper copy, A01 in microfiche. Technical Paper No 76-17, Issued by Army Corps of Engineers, Ft Belvoir, Va., Coastal Eng. Res. Ctr., October 1976. 224 p, 75 fig, 4 tab, 18 ref, 11 append. DACW 72-74-C-0012.

Descriptors: *Washington, *Breakwaters, *Model studies, *On-site tests, *Waves(Water), Performance, Coastal structures, Statistical methods, Boundary processes, Analytical techniques, *Floating breakwaters, *Friday Harbor(Wash).

A theoretical model for predicting the dynamic behavior of a floating breakwater was presented along with a report on a field experiment designed to provide basic data for verifying the model. The dynamic behavior characteristics investigated were total transmitted and reflected waves and their components, wave forces on the breakwater, motions of the breakwater, and forces on the mooring lines. The prediction model was developed from two-dimensional, linearized solutions of the hydrodynamical equations formulated in terms of a boundary value problem for the velocity potential. The floating breakwater at Friday Harbor, Washington, was used as the field experimental platform. Statistical summaries of all data were presented along with analyses of selected transmitted waves, transmission coefficients, and acceleration components. The summaries and analyses constitute a performance report of a particular floating breakwater as well as input to the development of the theoretical model. (Singh-ISWS)
W79-01526

WEIR DESIGN TO MAINTAIN EFFLUENT QUALITY FROM DREDGED MATERIAL CONTAINMENT AREAS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5G.
W79-01655

NUMERICAL SIMULATION OF TIDAL HYDRODYNAMICS, GREAT EGG HARBOR AND CORSON INLETS, NEW JERSEY,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2L.

W79-01661

DESIGN WAVE INFORMATION FOR THE GREAT LAKES; REPORT 5, LAKE SUPERIOR,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
D. T. Resio, and C. L. Vincent.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-057 127, Price codes: A10 in paper copy, A01 in microfiche. Technical Report H-76-1, June 1978, Report 5 of a series. 210 p, 6 append, 9 tab, 38 fig, 67 ref.

Descriptors: *Great Lakes, *Waves(Water), *Lake Superior, *Design wave.

This report contains hindcast wave information that is applicable to many planning and design purposes on Lake Superior. Historical wind data from stations along Lake Superior served as input to the numerical hindcast model, and significant wave heights were calculated for 5-, 10-, 20-, 50-, and 100-yr return periods. These results are provided in tabular form for 57 points along the Lake Superior shoreline. The mean significant period for each of these wave heights is also given. Information is provided for four seasons of the year (January-March, April-June, July-September, and October-December) and is separated into three approach directions relative to shore. (WES)
W79-01662

INDIAN CREEK PUMPING STATION, MANKATO, MINNESOTA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8C.
W79-01663

NAVIGATION CONDITIONS, SUCK BEND REACH, CHATTAHOOCHEE RIVER, ALABAMA AND GEORGIA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
B. K. Melton, and J. J. Franco.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 704, Price codes: A03 in paper copy, A01 in microfiche. Technical Report H-78-10, June 1978. 30 p, 10 fig.

Descriptors: *Hydraulic models, *Chattahoochee River(Ala-Geo), *Navigation conditions, *Navigation channels, *Suck Bend(Chattahoochee River), *Movable-bed models, Shoaling, Alabama, Georgia.

A movable-bed model reproducing about 1.5 miles of the Chattahoochee River to an undistorted scale of 1:72, model-to-prototype, was used to develop plans that would eliminate or reduce shoaling to permit uninterrupted navigation and to improve navigation for larger tows through Suck Bend Reach and in the approach to proposed State Highway 10 bridge. Results indicate: (1) Navigation conditions in Suck Bend are affected by shoaling of the bend's channel, elevation of bedrock, and adverse currents. (2) Shoaling in the bend can be eliminated with training structures but they would not provide satisfactory navigation conditions through the bend and in the approach to proposed bridge for larger tows. (3) Training structures and excavation and filling along the right bank in the bend to eliminate irregularities in the bank line and increase radius of curvature of the lower bend channel could provide satisfactory navigation conditions. (4) Larger down-bound tows would have to flank for passage through bridge span even with the realigned right bank because of the short approach to bridge. (5) Alignment of currents through proposed bridge could be improved with vane dikes along left side of channel upstream of bridge but dikes would reduce the maneuver area and could be navigation hazard. (WES)
W79-01664

AN INTRODUCTION TO EMISSION UNIFORMITY,
Rain Bird Sprinkler Mfg. Corp., Glenora, CA.
K. Solomon.
Drip/Trickle Irrigation, Vol 2, No 2, p 6-10, January/February 1977. 3 fig.

Descriptors: *Irrigation systems, *Irrigation engineering, *Irrigation design, Hydraulics, Hydraulic design, Irrigation efficiency, Flow rates, Uniform flow, Uniformity coefficient.

The more nearly perfect a system is in terms of emission uniformity, the more it is likely to cost. Various devices, material substitutions and design techniques are available to minimize the problems leading to nonuniformity of emission, but they all cost money and/or time. So the costs of approaching perfection must be weighed carefully against the costs of not achieving it. (Skogerboe-Colorado State)
W79-01686

PREDICTION OF FLOW HYDRAULICS FOR VEGETATED CHANNELS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
D. T. Y. Kao, and B. J. Barfield.
Transactions of the American Society of Agricultural Engineering, Vol. 21, No. 3 p 489-494, May-June 1978. 8 fig, 1 tab, 15 ref.

Descriptors: *Channel flow, *Grassed waterways, *Vegetation effects, *Roughness(Hydraulic), Model study, Mathematical models, Laboratory tests, Flumes, Grasses, Shallow water, Hydraulic properties, Hydraulic similitude, Flow, Graphical analysis, Vegetation, Hydraulics.

Simulated dense vegetation with random blade arrangements and different blade flexibilities were used to determine the hydraulic properties of flow of small, non-submerging depths. With the water flowing among the randomly patterned vegetation blades, drag resistance becomes the dominant force that retards the flow was established based on the momentum balance in the system. Experimental results were used to determine the coefficient of blade resistance and were plotted in terms of blade width and flow depth reynolds number respectively. Based on these plots and on successful introduction of the three different sets of parameteric curves, a graphical method was developed to permit the determination of flow depth in the vegetated channel. (Sims-ISWS)
W79-01726

INTERIM REPORT NO. 2, WABASH RIVER BASIN COMPREHENSIVE STUDY COVERING RESERVOIR SITES ON EMBARRASS RIVER, IL., AND CLIFTY CREEK AND PATOKA RIVER, IN. VOL. III, APPENDICES D-F.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 6B.
W79-01829

FLOOD FREQUENCY DESIGN IN SPARSE-DATA REGIONS,
Alaska Univ., Fairbanks. Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W79-01901

HYDRAULIC FRICTION LOSS IN SMALL DIAMETER PLASTIC PIPELINES,
Utah Univ., Logan. Dept. of Civil and Environmental Engineering.
T. C. Hughes, and R. W. Jeppson.
Water Resources Bulletin, Vol. 14, No 5, p 1159-1166, October 1978. 1 fig, 1 tab, 2 ref.

Descriptors: *Friction, *Plastic pipes, *Mathematical studies, Design, Design criteria, Hazen-Williams equation, Darcy-Weisbach equation, Reynolds number, Water supply, Hydraulics, Pipes, Equations, *Hydraulic friction, Friction loss, Smal plastic pipe.

Although estimation of hydraulic friction loss in pipelines is one of the most frequent routine computations made by water supply engineers, almost no post-construction analysis of the accuracy of these calculations exists in the literature. This paper reported the field measured friction losses in 3 one-mile sections of small diameter pvc pipe which had been in service for 10 years. Hazen-Williams and Darcy-Weisbach equations were examined to provide a framework for comparing Hazen-Williams coefficients recommended by pipe manufacturers to those obtained by the field measurements. The conclusion was that the C sub HW of 150 recommended by most pvc pipe manufacturers is too high for the diameter-velocity combinations encountered in rural dead-end small diameter lines. The measured coefficients averaged 133, which is close to that predicted by superimposing Hazen-Williams coefficients on the Moody diagram from which the fricton factor for the Darcy-Weisbach equation is obtained. (Lee-ISWS)
W79-01915

AIR-REGULATED SIPHON SPILLWAYS AT SPELGA DAM,
Ferguson and McIlveen, Belfast (Northern Ireland).
F. F. Poskitt, and E. M. Elsaway.
Journal of the Institution of Water Engineers and Scientists, Vol. 30, No. 4, p 177-190, June 1976. 9 fig, 13 ref.

Descriptors: *Siphons, *Spillways, *Hydraulic structures, *Model studies, Hydraulic models, Flow control, Flow characteristics, Pressure, Water pressure, Negative pressure, Hydraulic similitude, Laboratory tests, Foreign research, *Ireland, *Spelga Dam(Ireland), Air-regulated siphon.

The Spelga Dam is a 30 m high, concrete, gravity dam constructed for water supply purposes in 1957 in the Mourne Mountains in Northern Ireland. Increasing water demand required raising the impoundment level without increasing dam height. Investigations resuled in a decision to replace the 2 existing profiled surface spillweirs with automatically priming and de-priming air-regulated saddle siphons. Hydraulic modes obtained on water discharge, air flow, and pressure distribution for various lip-lengths and lip-levels and different types of ski-jumps. Using these data, an optimum design was reached, and the influence of each parameter on siphon performance was gauged. When priming, models exhibit 4 phases of flow similar to those observed in other air-regulated siphons which can be summarized as: (1) Weir flow - When the reservoir water level reaches the siphon crest, water flows over the crest; and the nappe forms 4 airpockets within the siphon barrel and provides an air seal at its exit. (2) Subatomspheric weir flow - As the reservoir level continues to rise, air is prevented from gaining direct access to the siphon entrance as well as to its exit. (3) Partialized flow - In this phase, the siphon is partially primed, and draws in and becomes filled with an air/water mixture. Any small increases in level are followed by relatively large increases in water discharge. (4) Black-water flow - A continuing rise in level exhausts the remaining air from the siphon and prevents any further air being drawn in under its hood, and the siphon becomes fully primed and reaches black-water flow. On de-priming the cycle is revesed, and the model exhibited good air regulation and minimal loss of impounding level. The Spelga siphons enabled an increase of 600 Ml or 22% in storage capacity to be secured. (Humphreys-ISWS)
W79-01925

WAVE FORCES ON CAUSEWAY-TYPE COASTAL BRIDGES,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
K. H. Denson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-289 367, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Mississippi State University Report, October, 1978. 42 p, 32 fig, 1 tab, 2 ref. OWRT A-118-MISS(1). 14-34-

Group 8B—Hydraulics

0001-8026.

Descriptors: *Water waves, *Structures, *Hydraulic models, Ocean waves, Wave action, Concrete structures, Failures, Hydraulic similitude, Physical models, Mississippi, Model studies, Bridges, *Wave forces, *Causeways, Bay St Louis(Miss), Hurricane Camille.

A 1:24 scale model of the Bay St. Louis, Mississippi bridge was used for the determination of lift and drag forces and rolling moment caused by normal incidence waves. The bridge was damaged by Hurricane Camille in 1969. The Bay St. Louis Bridge is a causeway-type, four-lane bridge of beam and slab construction. Pairs of lanes are structurally separated. Wave forces and moment were determined separately for the seaward and landward pairs of lanes. Thirty pages of design curves are presented in dimensionless form for scaling to prototype dimensions. The study was made more applicable to other bridges of similar geometry by varying the height of the bridge deck above the bay bottom. Results predict observed anchorage failure in the Bay St. Louis bridge.
W79-01983

8C. Hydraulic Machinery

GEOTHERMAL POWER AND WATER PRODUCTION STUDIES AT THE UNIVERSITY OF CALIFORNIA,
California Univ., Berkeley. Sea Water Conversion Lab.
For primary bibliographic entry see Field 3E.
W79-01546

INDIAN CREEK PUMPING STATION, MANKATO, MINNESOTA; HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
B. P. Fletcher.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A056 687 Price codes: A04 in paper copy, A01 in microfiche. Technical Report H-78-8, June 1978. 91 p, 3 tab, 22 photos, 48 fig.

Descriptors: *Pumping plants, *Flow characteristics, *Minnesota, Hydraulic models, *Indian Creek pumping station(Minn).

Model study conducted to evaluate characteristics of inflow to the original design gravity-flow section and pump sump and to develop modification for improving the distribution of flow to the gravity-flow section and pump intakes. The 1:10-scale model indicated need for minor modification to improve flow characteristics in the forebay and ensure satisfactory flow characteristics and pressures near the pump intakes. Major problems at pump intakes were generated by the concentrated jet produced adverse currents and turbulence near pump intakes. Satisfactory approach flows were obtained by installing divider walls to isolate each pump. Major problems at entrance to the gravity-flow section were generated by abrupt transition from the forebay to the gravity-flow section. These were Alleviated by streamlining entrance to the gravity-flow section. Improved flow conditions at entrance to the gravity-flow section. Improved flow conditions at entrance to the gravity-flow section reduced severe drawdown at the right abutment and provided a more direct route for flow to enter the gravity-flow section. Improved flow conditions to pump intakes eliminated surface vortexes and reduced pressure fluctuations from about 3.6 ft of water with the original design to 1.0 ft of water with recommended design. (WES)
W79-01663

WATER RESOURCES APPRAISAL FOR HYDROELECTRIC LICENSING, KERN RIVER BASIN, CALIFORNIA.
Federal Power Commission, Washington, DC. Bureau of Power.
1977, 83 p, 22 tab, 25 fig.

Descriptors: *Recreation facilities, *Hydroelectric power, *Multiple-purpose projects, *Cost-benefit analysis, *Economics, Hydroelectric project licensing, Reservoirs, Streamflow, Hydrology, Flood control, Irrigation, Amortization, Geology, Climate, Reservoir sites, Drainage, California, *Kern River Basin(CA), *Water service organizations, Water availability, Electric utility systems.

This report offers an extensive investigation of the Kern River Basin, its economy, its existing water and related land developments, its future economic and human needs, and possible future development and utilization of water resources. The Kern River Basin is located within Kern and Tulare Counties, CA. The water and related land resources of the Basin have been developed to a substantial degree for hydroelectric power, irrigation, flood control and recreational purposes. There are four hydroelectric power developments in the Basin located on the Kern River, one just above Isabella Lake and the other three in the canyon below the lake. The underdeveloped portions of the Basin include reservoir sites, opportunities for hydroelectric power development, and lands for future recreational expansion. In evaluating the potential multiple-purpose projects, the staff derived investment costs based on estimates contained in the Corps of Engineers' Draft Review Report on the Kern River Basin, July 20, 1966. These cost estimates were reviewed, modified, and updated as necessary. The annual costs used in the benefit-cost analyses include fixed charges, operation and maintenance expenses, and administration and general expenses. Project benefits considered included flood control, recreation, fish and wildlife enhancement, irrigation and hydroelectric power production. (Coan-NC)
W79-01835

HOT WATER RESERVOIR,
Aktiebolaget Atomenergi, Stockholm (Sweden). (Assignee).
P. H. E. Margen.
U.S. Patent No. 4,102,134, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 972, No 4, p 1403, July 25, 1978.

Descriptors: *Patents, *Reservoir construction, Impoundments, Surface waters, Heated water, Thermal insulation, Engineering structures, Barriers.

A hot water reservoir for a district heating plant may be a comparatively small one, for absorbing the variations in heat consumption between night and day, or it may be an extremely large one, for absoring the variations in heat consumption between summer and winter. The invention provides a simple and inexpensive hot water reservoir by using a flexible wall for enclosing a limited portion of a natural or artificial lake, sea bay or other body of water. The hot water reservoir comprises buoys floating on the surface of a lake and enclosing a limited area of the lake, a substantially vertical wal of a flexible material having its upper edge fastened to the buoys, weights fastened to the lower edge of the wal to maintain it in a vertical position, cables extending between the buoys and weights to reinforce the wall, and anchoring wires extending from the buoys toward the interior of the reservoir. The wall of the reservoir consists of two or more sheets substantially impervious to water and having stagnant water between them. They consist preferably of a fabric coated with plastic which can resist the temperature of the hot water. The loss of heat to the atmosphere is reduced by placing a heat insulating sheet to float on the hot water surface. (Sinha-OEIS)
W79-01862

8D. Soil Mechanics

STATE-OF-THE-ART APPLICABILITY OF CONVENTIONAL DENSIFICATION TECHNIQUES TO INCREASE DISPOSAL AREA STORAGE CAPACITY,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
S. J. Johnson, R. W. Cunny, E. B. Perry, and L. Devay.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 452. Price codes: A10 in paper copy, A01 in microfiche. Technical Report D-77-4, April 1977. 122 p, 59 fig, 34 tab, 75 ref, 4 append.

Descriptors: *Dredging, *Density stratification, *Storage, Disposal, Dikes, Seepage, Dewatering, Soil stabilization, Waste disposal, Rivers, Sediments, *Densitification techniques, Storage capacity.

Dredging to maintain or increase project depths in navigable channels and harbors often requires confined dredged material disposal areas. In many locations it is difficult to find suitable confined disposal areas, and even where available, environmental constraints prevent or restrict their use. This study determined whether conventional stabilization techniques can be used to densify or dewater material as a means for increasing the storage capacity of disposal areas. This was done on a judgement basis and without laboratory or field research. Coarse-grained material was not included, thus restricting the study to clays and silty clays which have high water contents after placement in disposal areas. It was concluded that conventional stabilization techniques can be used to increase disposal area capacity but that economic constraints restrict their use in some areas. Appendixes included a description of river sediments, a general description of conventional densification techniques, and calculations for the economic evaluation of densification techniques. (Roberts-ISWS)
W79-01520

SUMMARY REPORT OF THE PILOT STUDY PROGRAM, GREAT LAKES SHORELAND DAMAGE STUDY,
Corps of Engineers, Chicago, IL. North Central Div.
For primary bibliographic entry see Field 4A.
W79-01528

8E. Rock Mechanics and Geology

RESULTS OF TRACING EXPERIMENTS FOR CONSTRUCTION OF RESERVOIRS IN KARSTIC REGIONS,
Technische Hochschule, Graz(Austria). Dept. of Hydrogeology.
J. G. Zotl.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 28-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 450-458, 1977. 4 fig, 8 ref.

Descriptors: *Karst, *Tracers, *Hydrogeology, *On-site tests, On-site investigation, Exploration, Seepage control, Reservoirs, Foreign countries, Seepage research, Sinks, Carbonate rocks, Leakage, Karst hydrology, Groundwater movement, *Austria, *Greece.

Tracing experiments constitute one tool among several means of investigating karst terrains with regard to construction of reservoirs. Two examples of field experiments were described. In the karstmassif of the 'Steinernes Meer,' a combined injection of fluorescein dye And dyed lycopodium spores into various sinkholes was carried out to check the possibility of constructing a reservoir at an altitude of 1,400 m a.s.l. or 700 m above the Saalach valley, where a powerplant was to be situated. The result of the experiment showed that the main karstwater body in the area has its discharge still at the local base level of 1,400 m except for some single karst tubes to the Saalach valley. By concrete injections the basin became fully impermeable, and the powerplant is working. By a tracing experiment carries out in the region of the Evinos River (Western Greece), it was confirmed that the base level of erosion influences the possibility of using a river basin for the constru

tion of a reservoir. The injection of fluorescein dye and potassium chloride showed a connection between a katavothre in the Evinos basin and the springs of Nafpaktos in the Gulf of Korinth, the present base level of erosion. (See also W79-01932) W79-01976

USE OF THERMONICS IN FOUNDATION STUDIES IN KARSTIC TERRANE,
Hydrotechnics, Albuquerque, NM.
W. M. Turner.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography, Geology, Western Kentucky University, Bowling Green, Kentucky, p 459-462, 1977. 1 fig, 1 ref.

Descriptors: *Water temperature, *Karst, *Groundwater movement, *Kentucky, Dam foundations, Leakage, Exploration, Surveys, Aquifers, Potentiometric level, Water table, Groundwater, Seepage.

Thermonics is the analysis of groundwater flow systems based upon the redistribution of rising geothermal heat and/or shallow soil heat by moving groundwater. Because grounddwater is usually in motion, it may act as moving heat sink or heat source, the strength of which is related to the mass-rate of groundwater movement. Temperature measurements at shallow depths in small diameter holes are usually sufficient to pin-point the locations of wide zones or narrow fractures containing groundwater moving at relatively high rates. Thermonics used in conjunction with fracture trace analysis is probably the most powerful method of locating fractures and solution features in karstic terrane which contains moving groundwater and which may pose problems in earthen dam embankment stability. In 1971, a Thermonic survey of Wolf Creek Dam in Kentucky was made for the purpose of Determinig whether there were distinct zones of subflow in the dam foundation. Examination of both piezometric and Thermonic information indicated that piezometric information alone is not sufficient to define the path of high groundwater flow. The most significant conclusion reached was that the entire foundtion flow pattern of a dam foundation can be defined by Thermonics prior to construction, provided the foundation is saturated. (See also W79-01932) (Humphreys-ISWS)
W79-01977

8F. Concrete

A STUDY OF ARTICULATED CONCRETE REVETMENT MATTRESS: TEST AND ANALYSIS--RESULTS OF FY 1975 PROGRAM,
Construction Engineering Research Lab. (Army), Champaign, IL.
F. Kearney, and J. Prendergast.
Available from the National Technical Information Service, Springfield VA 22161 as AD-A033 440. Report CERL-TR-M-194, November 1976. 65 p, 11 fig, 5 append. IAO LMMDC-FA-75-2.

Descriptors: *Erosion control, *Bank protection, *Retaining walls, *Mississippi River, On-site tests, Concrete structures, Shore protection, Loads(Forces), Load distribution, Rivers, Monitoring, Structural analysis, Measurement, Instrumentation, Testing, Testing procedures, Prototype tests, Strain gages, Articulated concrete mattresses.

This report presented results of the fiscal year 1975 (FY 75) portion of a program to determine the magnitude and distribution of forces developed during launching of articulated concrete mattresses on the banks of the lower Mississippi River and to provide guidance for design changes in the mat structure. The FY 75 work involved monitoring the launching of some of the approximately 10,000 experimental squares cast with two 4,000-lbf (17.8 kN) breaking strength longitudinal wires instead of three. Results indicated that the two-longitudinal-wire mat will have adequate strength. Results also confirmed conclusions drawn from earlier work in the program (F. Kearney and J. Prendergast, Study of Articulated Concrete Revetment Mattress: Test and Analysis--Results of FY 1974 Program, U.S. Army construction Engineering Research Laboratory Technical Report M-94/ADA021774, 1976). (Humphreys-ISWS)
W79-01513

HOW TO INSURE A GOOD BRIDGE PLUG JOB,
Welex, Venice, LA.
D. Prince.
Special Report, June, 1973, 1 p.

Descriptors: *Wells, *Cement plug, Oil spills, Well casings, Well permits, *Well plugs, *Bridge plug, Well cap, Dead well.

A widely used bridge plug employs delayed-time valve closing to allow gas agitation or fluid flow to continue while an initial cement dump sets. After solid set, the bleed-off valve is automatically closed by dual timers preset on the surface before running the plug. Additional cement can then be dumped if well conditions and plug requirements so indicate. The plug can set in operating wells under pressure or in dead wells. The former costs slightly more because of the complexities of working under pressure and the special material and equipment required. A plug job is not recommended immediately after (3 to 4 hours) a well has been killed; best results are usually obtained when the well has had a chance to stabilize for at least a day, preferable two or three. (Bradbeer-NWWA)
W79-01549

8G. Materials

A STUDY OF ARTICULATED CONCRETE REVETMENT MATTRESS: TEST AND ANALYSIS--RESULTS OF FY 1975 PROGRAM,
Construction Engineering Research Lab. (Army), Champaign, IL.
For primary bibliographic entry see Field 8F.
W79-01513

HOW TO INSURE A GOOD BRIDGE PLUG JOB,
Welex, Venice, LA.
For primary bibliographic entry see Field 8F.
W79-01549

MANOEUVERABLE WEIR,
Pirelli Furlanis - Applicazioni Idrauliche Agricole Gomma S.p.A., Milan (Italy). (Assignee).
A. Colamussi, and V. Merli.
U.S. Patent No. 4,103,497, 5 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 973, No 1, p 57, August 1, 1978.

Descriptors: *Patents, *Structures, *Weirs, Overflow, Streamflow, Water levels, Channels, Flow control.

A weir for damming water in a waterway comprises a base member placed on the bottom of the waterway and a pivotable flap member having a wall enclosing an elongated space adapted to contan air under pressure. The flap member has one end wal hinged to the base member and is inclined upward from its hinged end above the base member. The manoeuverable weir is characterized by the fact that it contains openings in the metallic flap from which conduits depart creating a water current. (Sinha-OEIS)
W79-01870

TREATMENT OF AQUEOUS SYSTEMS,
CIBA GEIGY Ltd., London (England). (Assignee).
M. J. Smith, P. Miles, N. Richardson, and M. A. Finan.
U.S. Patent No. 4,105,551, 7 p, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 973, NO 2, p 737, August 8, 1978.

Descriptors: *Patents, *Water treatment, *Water softening, Scaling, hardness(Water), Chemical reactions, Inhibitors, Corrosion, Water quality control.

A method of inhibiting the precipitation of the scale forming salts of calcium, magnesium, barium and strontium from aqueous systems comprises adding to the system a scale inhibiting amount in the range of 1-200 ppm of a product such as a telomeric compound. The inhibitor product is used in conjunction with an effective amount of a dispersing or threshold agent. (Sinha-OEIS)
W79-01887

INFLUENCE OF KARST ON ENGINEERING IN IRELAND,
Geological Survey of Ireland and Minerex, Ltd., Dublin.
D. J. Burdon.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 419-431, 1977. 1 fig, 30 ref.

Descriptors: *Karst, *Engineering, *Geomorphology, *Natural resources, Reviews, Geology, Carbonate rocks, Limestones, Lime, Gypsum, Sands, Gravels, Agriculture, Coasts, Lakes, Rivers, Groundwater, Foreign countries, *Ireland.

This report aimed at bringing together published information on the karst of Ireland as karst affects engineering works. The paper emphasized the mainly indirect effects of karst and karstification processes on engineering activities, rather than hydrology, hydrogeology, or groundwater development. The geology and geomorphological conditions of the affected area were introduced first--an area of carbonate rocks that extends over about half the land surface. Karstic influences on engineering works then were described under 3 major categories: water-soluble raw materials in quarrying and mining; non-water engineering works; and water-related engineering works. The paper concluded with 30 Irish references, all of which have been quoted or referred to in the text. This may be considered as a first attempt to bring together the scattered literature dealing with the geological problems encountered by the engineer working in those areas of Ireland which are unerlain by carbonate rocks. (See also W79-01932) (Humphreys-ISWS)
W79-01973

CONSTRUCTION METHODS WHICH RECOGNIZE THE MECHANICS OF SINKHOLE DEVELOPMENT,
Reitz and Jens, Inc., St. Louis, MD.
H. M. Reitz, and D. S. Eskridge.
In: Hydrologic Problems in Karst Regions; Proceedings of Symposium held at Western Kentucky University, Bowling Green, Kentucky, April 26-29, 1976. Department of Geography and Geology, Western Kentucky University, Bowling Green, Kentucky, p 432-438, 1977. 3 fig, 2 ref.

Descriptors: *Karst, *Sinks, *Rock properties, *Missouri, Soil mechanics, Construction, Foundation rocks, Carbonate rocks, Filters, Geomorphology, Fractures(Geologic), Land subsidence, Limestones, Methodology, Graded filters, Soil arching.

Sinkhole formation starts by loss of soil downward into fissures in the surface of bedrock from hydraulic pressure surges at times when the system of joint and bedding plane fissures is filled with groundwater. Tracts of karst topography can be developed best by preventing anything but infiltrating water from going beneath the ground and by building inverted graded filters, topped out with controlled fills over historic sinkhole locations. For rigid support of heavy column loads, horizontally stratified bedrock can be turned into an elastic continuum with selective investigations, and grouting for strength, not for watertightness, with the depth and nature of the investigation and

construction varying with the characteristics of the heavy structure to be supported. In summary, the dynamic character of sinkholes must be recognized. The fact that a filled sink can return to life from above as well as below was recognized in the treatment methods outlined. (See also W79-01932) (Humphreys-ISWS)
W79-01974

8I. Fisheries Engineering

EVALUATION OF STREAM IMPROVEMENT PRACTICES IN SOUTHEASTERN TROUT STREAMS,
Oklahoma Cooperative Fisheries Research Unit, Stillwater.
O. E. Maughan, K. L. Nelson, and J. J. Ney.
Available from the National Technical Information Service, Springfield VA 22161 as PB-289 263, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center, Bulletin 115, September 1978. 67 p, 10 fig, 14 tab, 37 ref. OWRT A-067-VA(1).

Descriptors: *Stream habitat improvement, Virginia, *Stream improvement structures, Gabions, Southeast(US), Mountain Trout streams, Boulder emplacement, Log dams, Instream cover.

Most stream improvement techniques were designed and tested in the northern and western areas of the U.S., but little research has been done to evaluate the impact of these practices as they are used in the Southeast. This research evaluated the effects of stream rehabilitation devices on four southeastern Virginia trout streams. In both improved and reference sections of the streams, the study measured various physical parameters, and fish and benthic macroinvertebrate populations. Specifically, the streams were investigated to determine the effectiveness of stream improvement structures in providing increased habitat for trout and nongame species, and to determine the possible influences of the devices on aquatic invertebrates. The structure examined included log dams, gabion deflectors, and random boulder emplacements. In some cases, large pools were impounded above the dams; noticeable pool formation occurred below all dams. Runs and pools were associated with 11 of 18 gabions; the use of boulders to increase cover met with variable success. Fish biomass, trout biomass, and invertebrate numbers generally did not differ significantly between improved and reference sections. The utility of various stream improvement devices is dependent on their proper placement and on a correct assessment of their various limiting factors. Since each stream has a unique combination of biological, physical, and chemical parameters, stream improvement should be performed on a site-specific basis. This study should provide needed data for proper selection, design and installation of stream improvement structures.
W79-01590

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS, VOL. I. WORKING GROUP RESULTS,
Sigma Research, Inc., Richland, WA.
For primary bibliographic entry see Field 5C.
W79-01755

THE EFFECTS OF HIGHWAY CONSTRUCTION ON THE HYDROGEOLOGIC ENVIRONMENT AT BOWDEN, WEST VIRGINIA,
Bowden National Fish Hatchery, WV.
For primary bibliographic entry see Field 5B.
W79-01975

10. SCIENTIFIC AND TECHNICAL INFORMATION

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EFFECTS OF TURBIDITY AND SUSPENDED MATERIAL IN AQUATIC ENVIRONMENTS, LITERATURE REVIEW,
Wisconsin Univ., Stevens Point. Dept. of Biology; and Louisiana State Univ., Baton Rouge. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W79-01656

A REVIEW OF THE LITERATURE AND A SELECTED BIBLIOGRAPHY OF PUBLISHED AND UNPUBLISHED LITERATURE ON MARINE BIRDS OF ALASKA,
Fish and Wildlife Service, Anchorage, AK. Office of Biological Services and Coastal Ecosystems.
For primary bibliographic entry see Field 5C.
W79-01814

10D. Specialized Information Center Services

HYDROLOGIC PROBLEMS IN KARST REGIONS.
For primary bibliographic entry see Field 2F.
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PROGRESS OF KNOWLEDGE OF HYDROLOGY OF CARBONATE ROCK TERRANES - A REVIEW,
Geological Survey, Reston, VA. Office of the Chief Hydrologist.
For primary bibliographic entry see Field 2F.
W79-01933

REVIEW OF THE PHYSICAL HYDROLOGY OF THE CENTRAL KENTUCKY KARST,
National Park Service, Mammoth Cave, KY. Uplands Research Lab.
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SUMMARY OF GEOHYDROLOGIC RELATIONSHIPS IN THE LOST RIVER WATERSHED, INDIANA, APPLIED TO WATER USE AND ENVIRONMENT,
Indiana Univ. at Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 2F.
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INFLUENCE OF KARST ON ENGINEERING IN IRELAND,
Geological Survey of Ireland and Minerex, Ltd., Dublin.
For primary bibliographic entry see Field 8G.
W79-01973

10F. Preparation Of Reviews

WATER REUSE HIGHLIGHTS, A SUMMARY VOLUME OF WASTEWATER RECLAMATION AND REUSE INFORMATION,
American Water Works Association Research Foundation, Denver, CO.
For primary bibliographic entry see Field 5D.
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W79-01544	5D	W79-01627	5D	W79-01710	7B	W79-01793	5C
W79-01545	6B	W79-01628	5E	W79-01711	2G	W79-01794	5C
W79-01546	3E	W79-01629	2I	W79-01712	2G	W79-01795	5C
W79-01547	5E	W79-01630	4A	W79-01713	2K	W79-01796	5C
W79-01548	5E	W79-01631	6E	W79-01714	2G	W79-01797	5C
W79-01549	8F	W79-01632	2I	W79-01715	3F	W79-01798	5C
W79-01550	2K	W79-01633	5E	W79-01716	2K	W79-01799	5C
W79-01551	2K	W79-01634	7B	W79-01717	2G	W79-01800	5C
W79-01552	5B	W79-01635	6B	W79-01718	3F	W79-01801	5C
W79-01553	5A	W79-01636	3F	W79-01719	3F	W79-01802	5C
W79-01554	5A	W79-01637	7B	W79-01720	3F	W79-01803	5C
W79-01555	6G	W79-01638	7B	W79-01721	5A	W79-01804	5C
W79-01556	2G	W79-01639	7B	W79-01722	5F	W79-01805	5C
W79-01557	2G	W79-01640	5E	W79-01723	5D	W79-01806	5C
W79-01558	2G	W79-01641	2I	W79-01724	2G	W79-01807	5C
W79-01559	2G	W79-01642	7B	W79-01725	2G	W79-01808	5C
W79-01560	2G	W79-01643	5C	W79-01726	8B	W79-01809	5C
W79-01561	6A	W79-01644	2I	W79-01727	2B	W79-01810	5C
W79-01562	3B	W79-01645	5C	W79-01728	3F	W79-01811	5C
W79-01563	2I	W79-01646	6G	W79-01729	5E	W79-01812	5C
W79-01564	2I	W79-01647	5D	W79-01730	5G	W79-01813	5C
W79-01565	5D	W79-01648	6B	W79-01731	4A	W79-01814	5C
W79-01566	5D	W79-01649	5G	W79-01732	3F	W79-01815	5C
W79-01567	2K	W79-01650	6B	W79-01733	3F	W79-01816	5C
W79-01568	2B	W79-01651	4C	W79-01734	3C	W79-01817	5C
W79-01569	6B	W79-01652	2H	W79-01735	5G	W79-01818	5C
W79-01570	4A	W79-01653	5C	W79-01736	3F	W79-01819	5C
W79-01571	2G	W79-01654	5D	W79-01737	6C	W79-01820	5C
W79-01572	5D	W79-01655	5G	W79-01738	5B	W79-01821	5C
W79-01573	5D	W79-01656	5C	W79-01739	6B	W79-01822	5C
W79-01574	5D	W79-01657	5E	W79-01740	3F	W79-01823	5C
W79-01575	5D	W79-01658	5E	W79-01741	5G	W79-01824	5C
W79-01576	5D	W79-01659	5C	W79-01742	5F	W79-01825	5C
W79-01577	5A	W79-01660	5B	W79-01743	5C	W79-01826	3F
W79-01578	5A	W79-01661	2L	W79-01744	5C	W79-01827	6B
W79-01579	5D	W79-01662	8B	W79-01745	5C	W79-01828	6B
W79-01580	3A	W79-01663	8C	W79-01746	5C	W79-01829	6B
W79-01581	5D	W79-01664	8B	W79-01747	5A	W79-01830	6B
W79-01582	3A	W79-01665	2I	W79-01748	5A	W79-01831	5A
W79-01583	5D	W79-01666	5A	W79-01749	2F	W79-01832	6F

W79-01833	6F	W79-01916	2E	W79-01999	3F
W79-01834	5G	W79-01917	2H	W79-02000	5C
W79-01835	8C	W79-01918	5B		
W79-01836	3F	W79-01919	2J		
W79-01837	5G	W79-01920	2J		
W79-01838	6B	W79-01921	2G		
W79-01839	5D	W79-01922	2E		
W79-01840	5D	W79-01923	2L		
W79-01841	3F	W79-01924	7B		
W79-01842	5G	W79-01925	8B		
W79-01843	4A	W79-01926	2J		
W79-01844	5G	W79-01927	7C		
W79-01845	6B	W79-01928	7C		
W79-01846	5G	W79-01929	7C		
W79-01847	3F	W79-01930	7C		
W79-01848	5G	W79-01931	7C		
W79-01849	3F	W79-01932	2F		
W79-01850	4A	W79-01933	2F		
W79-01851	4A	W79-01934	2F		
W79-01852	4A	W79-01935	6E		
W79-01853	4A	W79-01936	2F		
W79-01854	4A	W79-01937	2F		
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W79-01856	4A	W79-01939	2F		
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W79-01872	3F	W79-01955	2F		
W79-01873	5F	W79-01956	2F		
W79-01874	5D	W79-01957	2F		
W79-01875	5D	W79-01958	2F		
W79-01876	5D	W79-01959	2F		
W79-01877	5D	W79-01960	2F		
W79-01878	5F	W79-01961	2F		
W79-01879	3C	W79-01962	2F		
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W79-01881	5D	W79-01964	2F		
W79-01882	3F	W79-01965	2F		
W79-01883	2K	W79-01966	5B		
W79-01884	5D	W79-01967	5B		
W79-01885	3F	W79-01968	5B		
W79-01886	5D	W79-01969	5B		
W79-01887	8G	W79-01970	5B		
W79-01888	5D	W79-01971	6E		
W79-01889	5G	W79-01972	5B		
W79-01890	5D	W79-01973	8G		
W79-01891	6E	W79-01974	8G		
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W79-01894	3F	W79-01977	8E		
W79-01895	2D	W79-01978	5D		
W79-01896	3D	W79-01979	6B		
W79-01897	5A	W79-01980	4A		
W79-01898	5B	W79-01981	5A		
W79-01899	2A	W79-01982	5C		
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W79-01902	5C	W79-01985	5B		
W79-01903	5B	W79-01986	6B		
W79-01904	5G	W79-01987	3D		
W79-01905	5B	W79-01988	5G		
W79-01906	5C	W79-01989	7C		
W79-01907	5C	W79-01990	3F		
W79-01908	5B	W79-01991	5D		
W79-01909	3C	W79-01992	4B		
W79-01910	2I	W79-01993	5C		
W79-01911	2L	W79-01994	5C		
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SOURCE	ACCESSION NUMBER	TOTAL
A. CENTERS OF COMPETENCE		
Colorado State University, Irrigation Return Flow Quality	W79-01511, 01673 01679, 01686 01689--01690 01692--01693 01699, 01702 01704--01721 01732--01734 01736--01737 01751--01752 01754, 01761 01766, 01775 01777 01781--01782 01785--01786 01826, 01841 01847, 01849 01879, 01885 01910, 01990 01999	53
Cornell University, Policy Models for Water Resources Systems	W79-01731	1
East Central Oklahoma State University, Agricultural Livestock Wastes	W79-01605, 01628 01633, 01640 01649, 01671	6
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Franklin Institute (FIRL), Municipal and Industrial Wastewater Treatment Technology	W79-01703, 01729 01757--01760 01762--01765 01767--01774 01776 01778--01780	22

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A. CENTERS OF COMPETENCE (CONTINUED)		
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Institute of Paper Chemistry Water Pollution from Pulp and Paper Industry	W79-01593--01596 01599--01604 01606--01627	32
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University of Arizona, Arid Land Water Resources	W79-01730	1
University of North Carolina, Metropolitan Water Resources Planning and Management	W79-01827--01840 01842--01846 01848 01850--01859	30
University of Wisconsin, Eutrophication	W79-01993--01998 02000	7
B. STATE WATER RESOURCES RESEARCH INSTITUTES	W79-01536--01548 01556--01561 01563--01572 01587--01592 01645 01722--01723 01738--01750 01886--01908 01979--01988	84
C. OTHER		
Army Engineer Waterways Experiment Station	W79-01655--01666	12
BioSciences Information Service	W79-01550, 01698	2

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C. OTHER (CONTINUED)		
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University of Massachusetts (Wetlands)	W79-01629--01632 01634--01639 01641--01644 01646, 01648 01650--01652	19

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A. CENTERS OF COMPETENCE
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Illinois State Water Survey,
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Water Pollution from Pulp
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National Water Well
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B. OTHER (CONTINUED)

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Ocean Engineering Information
Service (Outer Continental
Shelf) W79-01559

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Technology W79-01555--01558

U. S. Geological Survey W79-01548

University of Massachusetts
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C. OTHER

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